Allen-Bradley

1336 FORCE™ PLC® Communications Adapter (Series B)

Firmware Rev. 5.xx
(Catalog No. 1336T-GT1EN)

User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. “Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls” (Publication SGI-1.1) describes some important differences between solid state equipment and hard–wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will the Allen-Bradley Company be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, the Allen-Bradley Company cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Allen-Bradley Company with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss.

Attentions help you:

- identify a hazard
- avoid the hazard
- recognize the consequences

Important: Identifies information that is especially important for successful application and understanding of the product.

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Preface

Read this preface to familiarize yourself with this manual. This preface covers the following topics:

- who should use this manual
- an overview of the PLC Communications Adapter Board
- the purpose of this manual
- terms and abbreviations
- conventions used in this manual
- Allen–Bradley support

Who Should Use this Manual

Use this manual if you are responsible for installing, wiring, starting up, programming, or troubleshooting control systems that use the PLC Communications Adapter Board.

To use this product, you should be able to program and operate an Allen–Bradley PLC and/or DriveTools. In particular, you need to be familiar with remote I/O concepts and configurations, and be able to program block transfer instructions.

What Is the PLC Communications Adapter Board

You can add a PLC Communications Adapter Board to your 1336 FORCE system to expand the communications capabilities. The following are the major features of the PLC Communications Adapter Board:

- support for both Data Highway Plus™ (DH+) and remote I/O (RIO) communications with up to five SCANport™ devices and two RIO devices that allow you to connect to a wide range of Allen–Bradley devices
- an RIO scanner mode that allows your 1336 FORCE system to control a logical rack of devices without using a PLC

Note: Block transfer and complementary I/O are not supported with RIO scanner mode.

- four analog inputs and four analog outputs
- function block programming to help you customize the way your drive operates
- trending capabilities as a diagnostic tool to allow you to capture data values for a parameter
- a 32–event fault and warning queue

Purpose of this Manual

This manual:

- provides planning, installation, and wiring information for the PLC Communications Adapter Board
- explains the procedures you need to mount and configure your PLC Communications Adapter Board
- describes the available parameters and block transfer instructions
- provides information to help you troubleshoot your PLC Communications Adapter Board

Contents of this Manual

This manual contains the following information:

Chapter:	Title:	Contents:
	Preface	Describes the purpose, background, and scope of this manual as well as an overview of this product.
1	Installing and Wiring Your PLC Communications Adapter Board	Provides procedures for installing and wiring your PLC Communications Adapter Board.
2	Starting Up	Provides information for starting up your system.
3	Using RIO Communications	Provides information about using RIO communications with the PLC Communications Adapter Board. This chapter includes sections on redundant RIO mode and RIO scanner mode.
4	Using DH+ Communications	Provides information about using DH+ communications with the PLC Communications Adapter Board.
5	Understanding the Resources of Your Drive	Provides an overview of the function block software and the available system resources.
6	Parameters	Provides information about the parameters that are specific to the PLC Communications Adapter Board.
7	Block Transfer Services	Provides information about the block transfer instructions.
8	Troubleshooting	Explains how to interpret and correct problems with your PLC Communications Adapter Board.
9	Using the Trending Features	Provides step–by–step instructions for using trending for diagnostic purposes.
10	Specifications and Supplemental Information	Provides specifications and supplemental information including a parameter cross reference by number and name and a chart of the DIP switch settings.

ATTENTION: This board contains ESD (electrostatic discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing, or repairing this assembly. Component damage may result if you do not follow ESD control precautions. If you are not familiar with static control procedures, refer to *Guarding Against Electrostatic Damage*, Allen–Bradley Publication 8000–4.5.2, or any other applicable ESD protection handbook.

ATTENTION: Only personnel familiar with SCANport devices and associated machinery should plan or implement the installation, start–up, or subsequent troubleshooting of this board. Failure to comply may result in personnel injury and/or equipment damage.

Related Documentation

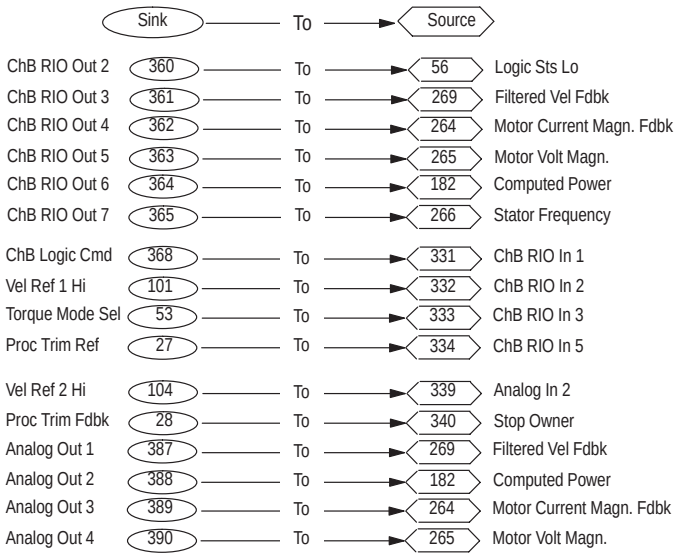
The following documents contain additional information concerning related Allen–Bradley products. To obtain a copy, contact your local Allen–Bradley office or distributor.

For:	Read this document:	Document number:
A description of function blocks and function block programming	1336 FORCE™ PLC Communications Adapter Function Block Programming Manual	1336 FORCE–5.9
Information to help you install, program, start up, and maintain the 1336 FORCE digital ac drive	1336 FORCE™ Field Oriented Control User Manual	1336 FORCE–5.12
In–depth information on grounding and wiring Allen–Bradley programmable controllers	Allen–Bradley Programmable Controller Grounding and Wiring Guidelines	1770–4.1
A description on how to install a PLC–5® system	PLC–5 Family Programmable Controllers Hardware Installation Manual	1785–6.6.1
A description of important differences between solid–state programmable controller products and hard–wired electromechanical devices	Application Considerations for Solid–State Controls	SGI–1.1
An article on wire sizes and types for grounding electrical equipment	National Electrical Code	Published by the National Fire Protection Association of Boston, MA.
A complete listing of current Allen–Bradley documentation, including ordering instructions. Also indicates whether the documents are available on CD–ROM or in multi–languages.	Allen–Bradley Publication Index	SD499
A glossary of industrial automation terms and abbreviations	Allen–Bradley Industrial Automation Glossary	AG–7.1

Terms and Abbreviations

The following terms and abbreviations are specific to this product. For a complete listing of Allen–Bradley terminology, refer to the *Allen–Bradley Industrial Automation Glossary.*

This term:	Has the following definition:
BRAM	See Non–volatile memory.
Configuration parameter	A configuration parameter is a sink parameter whose value may be changed while the drive is in operation. Configuration parameters are used to input reference and feedback information to the drive and to provide monitoring points for control signals. Refer to the 1336 FORCE user manual for a description of source and sink parameters.
Drive units	Drive units are the actual values of the parameters as stored within the drive parameter table. The drive units may be converted to engineering units or to hexadecimal for display, or may be displayed directly in drive units. All internal values in the drive are in terms of per unit numbering.
Engineering units	Engineering units is a label given to parameter data that specifies what units are to be used to display the parameter value.
Function blocks	A function block is a firmware subroutine that is stored in memory within the PLC Communications Adapter Board. The PLC Communications Adapter Board provides 28 different function block types. By combining function blocks, you can customize the way your drive operates. Refer to the 1336 FORCE function block programming manual for more information about function blocks.

This term:	Has the following definition:
Links	A link is a software connection between a linkable sink parameter and a source parameter. You can use links to transfer data from the source parameter to a linkable sink parameter. Your 1336 FORCE user manual provides a list of linkable sink parameters. The PLC Communications Adapter Board allows up to 50 links in addition to 4 analog output links. You can only program links when the drive is not running. Links are stored in BRAM and established at power up, BRAM recall, and/or system reset. There are two types of links: • User Link — A user link is a software connection that you establish. You can change these links as needed. • Default Link — A default link is a software connection between two parameters that is made when the drive is initialized. The default links are shown here. The links are made from the source side, and the data transfer occurs in the opposite direction. **Default Links** 
Mask parameters	Through the SCANport interface, up to five different SCANport adapters and two different remote I/O (RIO) devices can control the 1336 FORCE. With this flexibility, conflicts are inherent. The PLC Communications Adapter Board allows you to make functional masks. At each port, you can selectively lock out functions such as start, jog, and drive direction as well as many fault interlocks by using mask parameters to select the allowable functions for each port.
Non–volatile memory	Non–volatile memory is data memory in the drive that retains the values of all data even when power is disconnected from the drive. BRAM (Battery backed Random Access Memory) chips are used for the non–volatile memory to store some of the drive parameters, links, and user text.

This term:	Has the following definition:
Owner parameters	The PLC Communications Adapter Board allows one or more control devices or adapters to own start, jog, direction, and other control functions. To avoid conflict, some owners are exclusive. For example, only one device can issue a forward direction speed command. Others have multiple control. For example, all devices can jog the drive in the forward direction, but only at a set speed. Devices can, for example, jog the drive in the forward direction only if the jog mask parameter allows for it.
Parameter entry	A parameter entry refers to the information stored in the drive that contains the parameter number, parameter data, and all other information related to the specific parameter.
Parameter table	A parameter table is a table of parameter entries for all configuration sink and source parameters in the drive.
Per–unit numbering	Per–unit numbering is a numbering system that defines a specific numeric value as representing 100% of a particular quantity being measured. The number 4096 is used in many places in the drive to represent one per unit.
Sink parameters (Read and Write parameters)	Sink parameters accept data from other parameters. The drive then uses this data to perform the desired functions. An example of a sink parameter is the external velocity reference parameter that accepts a speed reference from a device such as a PLC. Throughout this manual, the following symbol indicates a sink parameter:
Source parameters (Read–only parameters)	Source parameters provide real–time information that is available for other devices to use. These devices can include PLC controllers, operator interface devices, programming terminals, etc. Throughout this manual, the following symbol indicates a source parameter:
Trending	Trending is a diagnostic tool used to capture and retain an input parameter data value (such as velocity feedback) until a trigger condition (drive fault or malfunction condition) halts or suspends sampling.

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.

Allen–Bradley Support

Allen–Bradley offers support services worldwide, with over 75 Sales/Support Offices, 512 authorized Distributors and 260 authorized Systems Integrators located throughout the United States alone, plus Allen–Bradley representatives in every major country in the world.

Local Product Support

Contact your local Allen–Bradley representative for:

- sales and order support
- product technical training
- warranty support
- support service agreements

Technical Product Assistance

If you need to contact Allen–Bradley for technical assistance, please review the information in the *Troubleshooting* chapter first. If you are still having problems, then call your local Allen–Bradley representative.

Catalog Number Description

A language module is located on each PLC Communications Adapter Board. Catalog numbers identifying the language modules are as follows:

1336T
1336T = Field Installed
(Blank) = Factory Installed

GT1EN
GT1EN = English Version
GT1EN = English Version
GT1FR
GT1FR = French Version
GT1DE
GT1DE = German Version
GT1IT
GT1IT = Italian Version
GT1ES
GT1ES = Spanish Version

Notes

Installing and Wiring Your PLC Communications Adapter Board

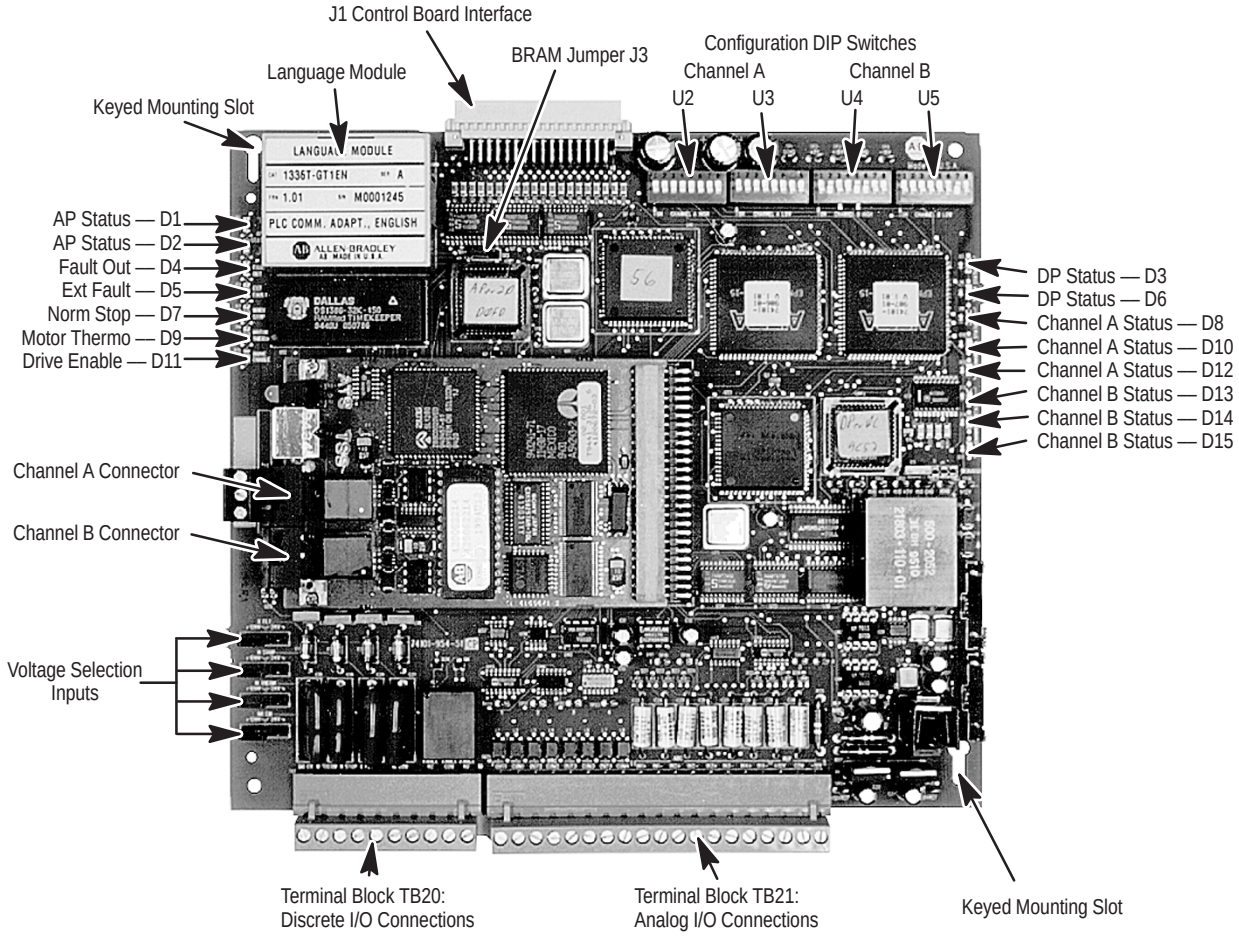
Chapter Objectives

Chapter 1 provides information so that you can:

- mount the PLC Communications Adapter Board
- configure and connect the communications
- configure and set up the discrete inputs and analog I/O

Important: The installation and wiring information in this manual is specific to the PLC Communications Adapter Board. For information about mounting the drive, connecting the motor leads, or connecting the power, refer to the 1336 FORCE user manual.

The following illustration shows the PLC Communications Adapter Board.



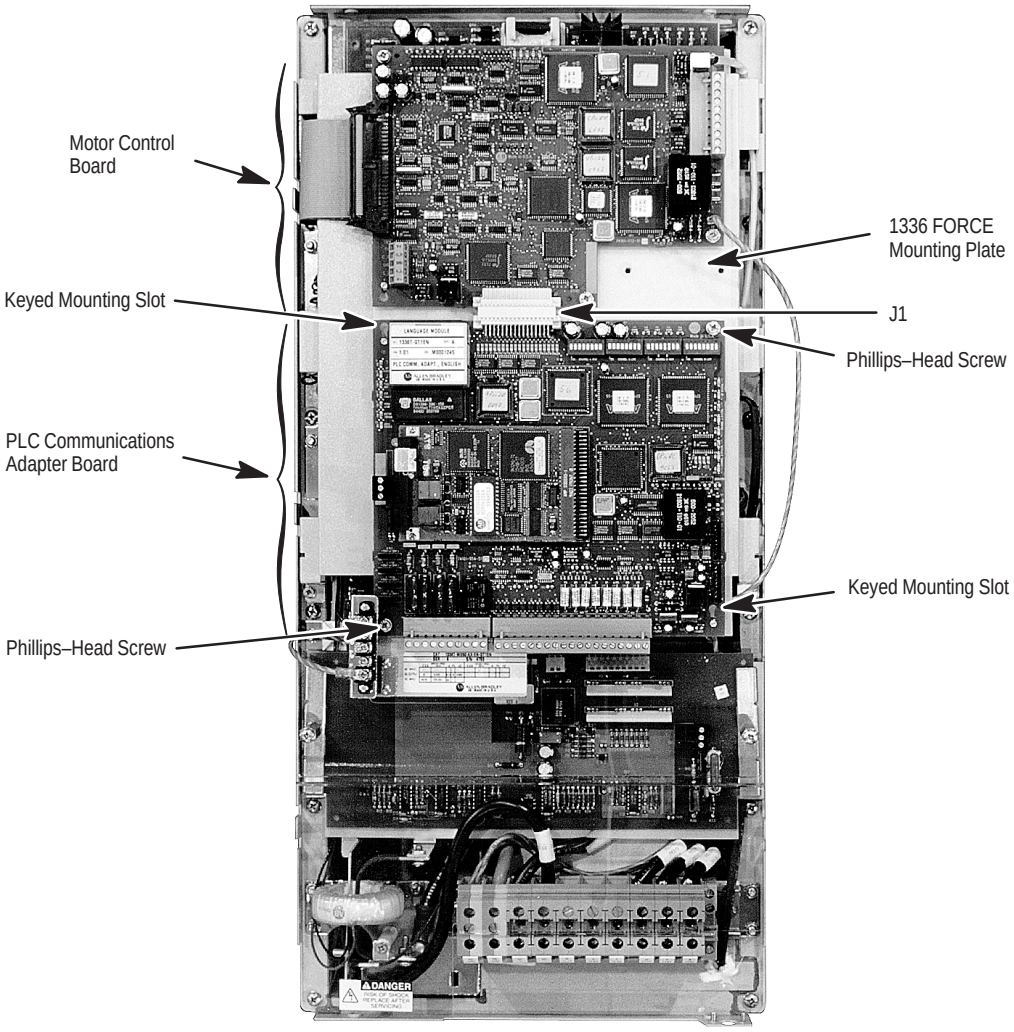
Mounting the PLC Communications Adapter Board

To mount your PLC Communications Adapter Board on to your 1336 FORCE, you need to:

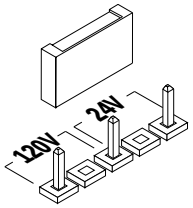
ATTENTION: To avoid a shock hazard, assure that all power to the drive has been removed before proceeding.

1. Place the PLC Communications Adapter Board over the keyed mounting slots.
2. Slide the board up into the main control board connector J1.
3. Secure the board to the 1336 FORCE mounting plate using the two Phillips–head screws that are provided with the kit.

The following illustration shows the main control board of the 1336 FORCE with the PLC Communications Adapter Board mounted on it.



Setting Your Input Voltage

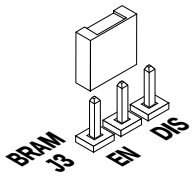


To select your input voltage, you need to set the discrete I/O jumpers.

ATTENTION: To avoid damaging the PLC Communications Adapter Board, you must set all discrete I/O jumpers to the same input voltage applied to the PLC Communications Adapter Board. The voltage must be either 24V dc or 120V ac.

Set this discrete I/O jumper:	To set this input:	To either:
DR EN	Drive Enable	24V dc or 120V ac
M THERM	Motor Thermoguard	24V dc or 120V ac
N STOP	Normal Stop	24V dc or 120V ac
X FLT	External Fault	24V dc or 120V ac

Writing to BRAM



You can use jumper J3 on the PLC Communications Adapter Board to either allow (enable) or not allow (disable) writes to Battery backed Random Access Memory (BRAM).

Choose:	To:
EN (Enabled)	Allow writes to BRAM.
DIS (Disabled)	Not allow writes to BRAM.

Terminal Block Locations

Two terminal blocks, TB20 and TB21, are provided at the bottom of the PLC Communications Adapter Board for discrete and analog I/O wiring.

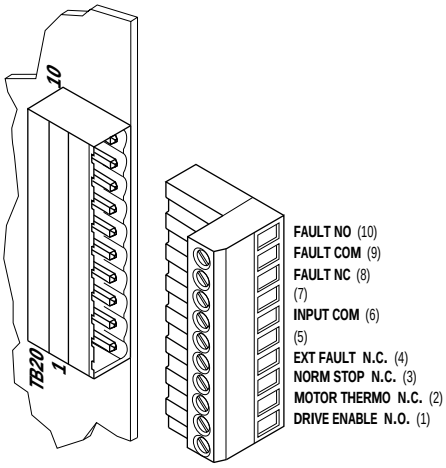
▶ To make the connections more easily, you can pull apart the terminal blocks when connecting the cables.

Both terminal blocks accept a maximum wire size of 3.3 mm^2 (12 AWG) and a minimum wire size of 0.60 mm^2 (30 AWG). Maximum torque is 0.79 N–m (7 lb–in). Recommended control signal wire is:

Belden number:	Description for equivalent:
8760	0.750 mm^2 (18 AWG), twisted pair, shielded
8770	0.750 mm^2 (18 AWG), 3–conductor, shielded
9460	0.750 mm^2 (18 AWG), twisted pair, shielded

Discrete I/O

Terminal block TB20 provides the discrete I/O capabilities.



Discrete Outputs

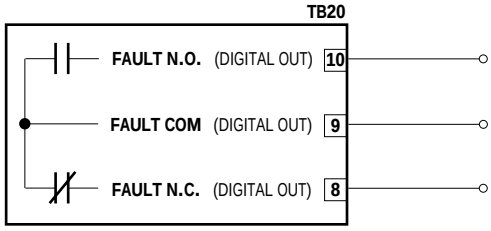
Fault outputs from the 1336 FORCE are supplied at terminal block TB20 on the PLC Communications Adapter Board. Fault outputs provide warning or fault signals based on drive status.

The Fault NC, Fault Com, and Fault NO outputs are relay contacts that provide fault signals. If a contact is closed (energized), then there is no fault. If a contact is open, there is a fault.

The following values are the contact ratings for the Fault NC, Fault Com, and Fault NO relays:

2A at 115V ac
2A at 30V dc

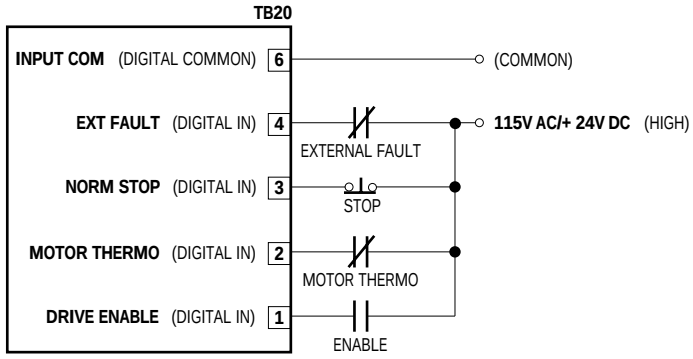
The typical digital output connections can be shown as follows:



Discrete Inputs

Discrete inputs to the 1336 FORCE are supplied through the PLC Communications Adapter Board at terminal block TB20. Discrete inputs enable and stop the drive as well as providing checks on drive and motor operation.

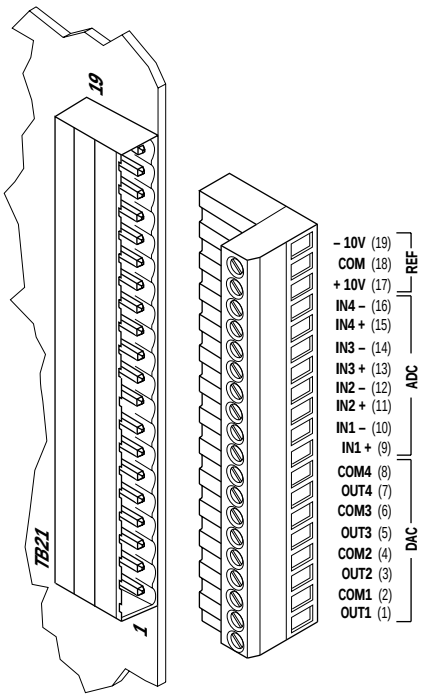
The typical digital input connections when using an external power source can be shown as follows:



The following are the signals that may be used:

This signal:	Has the following meaning:
DRIVE ENABLE	A drive enable signal must be present before the drive will acknowledge a start command. If LED D11 drive enable on the PLC Communications Adapter Board is illuminated, the drive has received an enable signal allowing drive logic to accept a start command.
MOTOR THERMO	A motor thermo signal allows you to connect an NC motor thermal switch to the 1336 FORCE. Motor Thermo LED D9 on the PLC Communications Adapter Board illuminates if a motor over–temperature condition occurs. The drive issues a fault or warning based on the fault configuration defined by VP Fault Select (parameter 88) and VP Warn Select (parameter 89). **ATTENTION:** The drive start/stop control circuitry includes solid–state components. If hazards due to accidental contact with moving machinery or unintentional flow of liquid, gas, or solids exist, an additional hardwired stop circuit is required to remove ac line power to the drive. When you remove ac input power, there is loss of inherent regenerative braking effect and the motor coasts to a stop. An auxiliary braking method may be required.
NORM STOP	A normal stop signal specifies an NC maintained stop input that stops the drive according to the stop mode you specified using parameter 59. The drive responds the same way it would if the stop bit were set in any logic command. When a stop signal is present, the Norm Stop LED D7 on the PLC Communications Adapter Board is illuminated, and the drive cannot run until the stop signal is removed.
EXT FAULT	An Ext Fault signal allows you to wire an external signal into the 1336 FORCE. If external fault input voltage is removed, the External Fault LED D5 on the PLC Communications Adapter Board is illuminated. The drive then issues a fault or warning based on the fault configuration defined by parameters 88 and 89.

Analog I/O Connections



You can access the analog I/O connections at terminal block TB21. There are four analog inputs and four analog outputs. Each of the analog I/O parameter have scale and offset parameters. The analog inputs can be linked to any linkable sink parameter, and the analog outputs can receive information from any parameter in the drive. The drive increments the analog I/O every two milliseconds.

Analog Inputs

The PLC Communications Adapter Board has 4 analog inputs that have a range of ±10V and a digital resolution of 12 bits. These inputs are differential inputs with noise rejection filtering. Each input has a gain and offset adjustment.

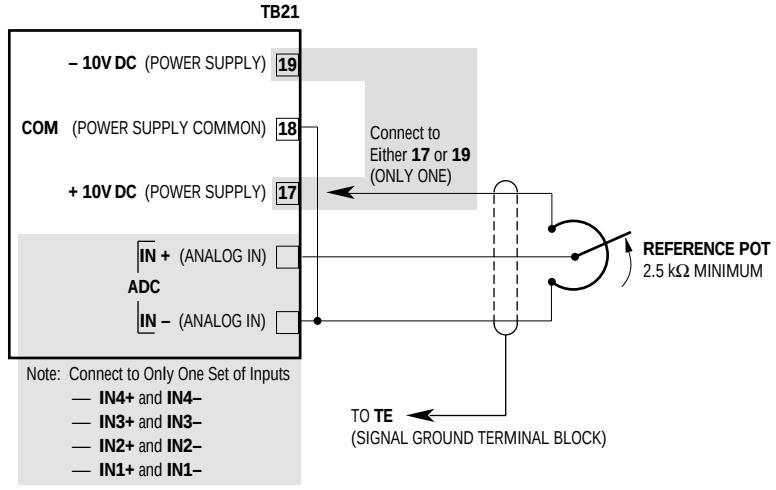
The A/D converter is a 12–bit device where an input value of +10V results in a digital value of 2048. Likewise, an input value of –10V results in a digital output value of –2048.

Chapter 2, *Starting Up*, describes the parameters associated with scaling analog values.

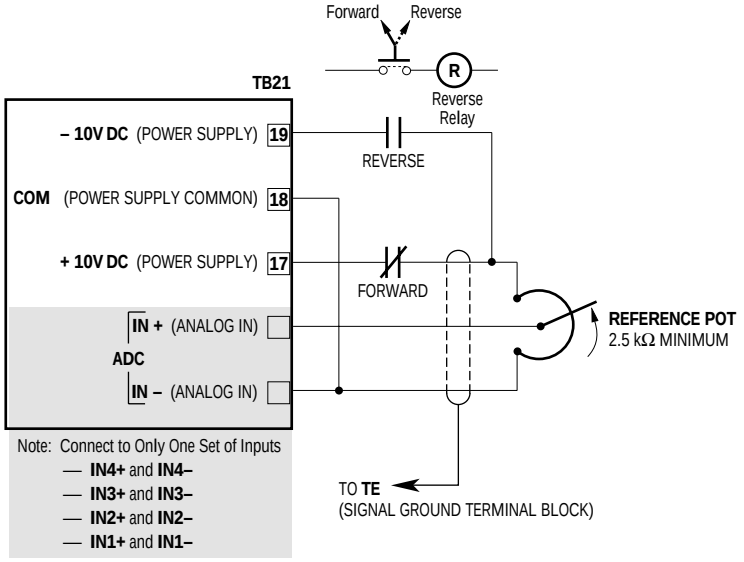
For an analog input to control a function, you need to:

1. Link the analog input parameter(s) to a parameter such as velocity reference.
2. Set up the scale and offset parameters associated with that analog input parameter.

The typical analog input connections for unidirectional operation are shown as follows:



The typical analog input connections for bidirectional operation can be shown as follows:



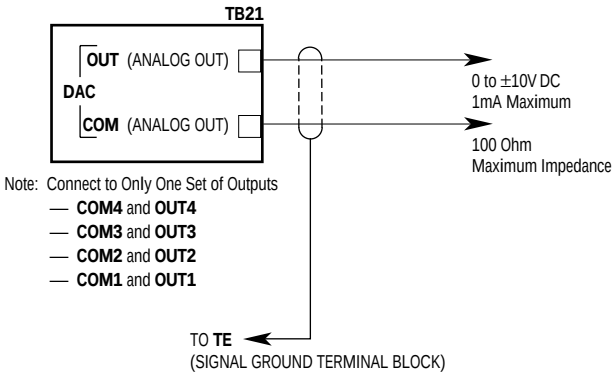
The following table shows the analog input specifications:

Specifications:	Value:
Differential impedance	Greater than 1 Ohm
Single ended impedance	20K Ohm
Maximum voltage	±10V

Analog Outputs

The PLC Communications Adapter Board has 4 analog outputs that have a range of ±10V and a digital resolution of 12 bits. Chapter 2, *Starting Up*, describes the parameters associated with scaling analog values.

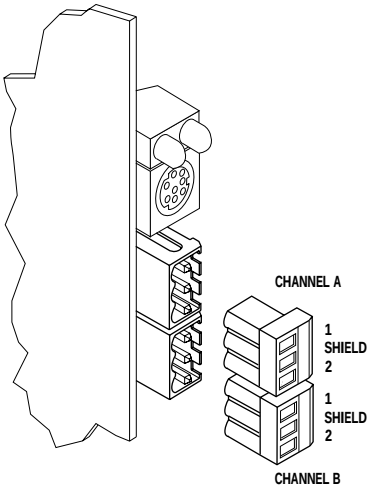
The typical analog output connections can be shown as follows:



Determining Your Communications Configuration

The PLC Communications Adapter Board provides two channels (A and B) for connecting to Allen–Bradley's RIO or DH+ networks. Each channel allows the 1336 FORCE to communicate directly with or without a PLC and is independently programmable. With RIO scanner, you do not necessarily need to communicate with the PLC.

To connect channel A or B of the PLC Communications Adapter Board to the RIO and DH+ communications systems, you need to use twinaxial cable. The connections are shown on the following pages. The following table provides the information about the twinaxial cable.



Cable:	Description:
Type	Belden 9463. Consult Allen–Bradley if you use a cable other than a Belden 9463.
Length	You need to use a minimum of 3.05 meters (10 feet) for all connections. Shorter lengths may cause signal reflections.
Connections	You should connect all three conductors (Blue, Shield, and Clear) at each wiring point. You should not make any additional ground connections to the shield. **Important:** Do not use star type connections. You may only connect two cables at any wiring point on a series connected application.
Terminations	Two 1770–XT or 150 Ohm (82 Ohm for 230K baud) resistors are used for cable termination. Use one at each end of the cable.

You can use the DIP switches that are on the PLC Communications Adapter Board to configure one or both channels for DH+ or RIO communications. Use switches U2 and U3 to configure channel A, and switches U4 and U5 to configure channel B.

▶ Chapter 2, *Starting Up*, provides information for setting the DIP switches.

RIO Configuration for Both RIO Adapter and RIO Scanner

When you configure a communications channel for RIO connection, the PLC Communications Adapter Board looks like a remote I/O rack to an Allen–Bradley PLC or a PLC Communications Adapter Board functioning as an RIO scanner.

▶ Chapter 3, *Using Remote I/O Communications*, provides further information about RIO adapter and RIO scanner modes.

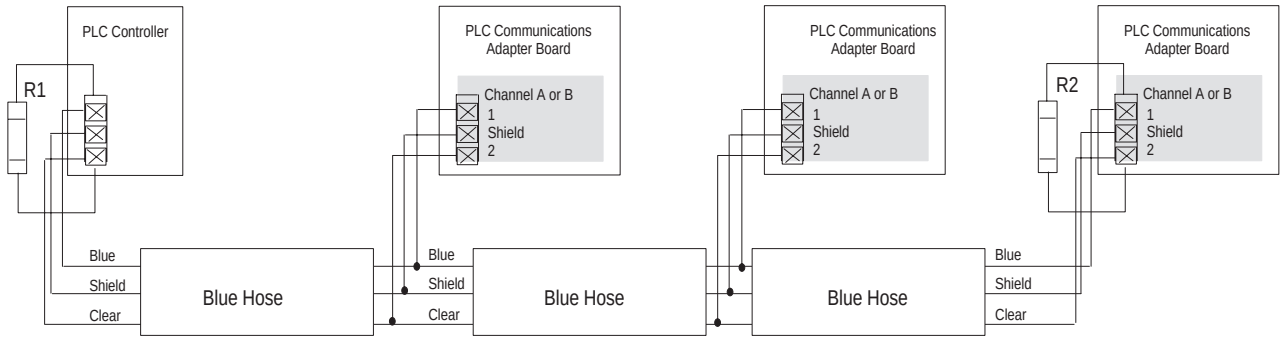
When configured for RIO adapter communications, the PLC Communications Adapter Board can:

- Support 57.6K, 115K, or 230K baud communication rates at all valid module groups.
- Be configured as a 1/4, 1/2, 3/4, or full I/O rack.
- Be configured to ignore PLC fault conditions and continue operating.
- Support transfer of multiple drive parameter read or writes in a single block transfer.
- Allow the 1336 FORCE to be connected to two PLCs in a master/backup configuration (which is referred to as redundant mode) where drive control can be switched between two PLCs and specifies which PLC is currently in control.
- Allow the block transfer feature to be disabled via a DIP switch setting and provide an extra word of discrete data.

The terminating resistors (R1 and R2 in the figure below) depend on the baud rate:

If you are using this baud rate:	Then, you need to use this terminating resistor:
57.6K	150 Ohm
115K	150 Ohm
230K	82 Ohm

The following is the wiring configuration necessary for RIO adapter:



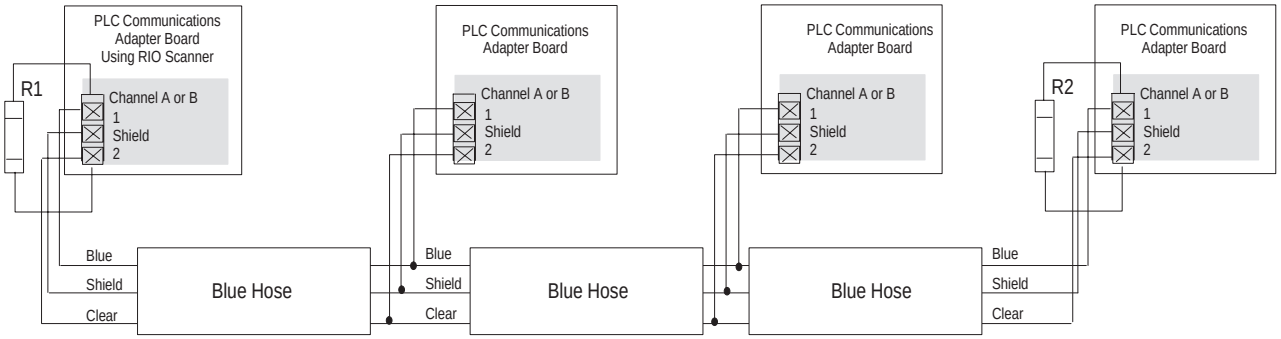
When configured for RIO scanner communications, the PLC Communications Adapter Board can:

- Support 57.6K, 115K, or 230K baud communication rates at all valid module groups.
- Be configured as a 1/4, 1/2, 3/4, or full I/O rack.
- Be configured to ignore PLC fault conditions and continue operating.
- Allow the 1336 FORCE to scan a logical rack of data from multiple devices (such as Flex I/O, 1771–ASB, or a 1336 FORCE as an adapter)

The terminating resistors (R1 and R2 in the figure below) depend on the baud rate:

If you are using this baud rate:	Then, you need to use this terminating resistor:
57.6K	150 Ohm
115K	150 Ohm
230K	82 Ohm

The following is the wiring configuration necessary for RIO scanner:



You can connect up to four devices to a channel of a PLC Communications Adapter Board that is operating in RIO scanner mode. These devices do not have to be other 1336 FORCE drives with PLC Communications Adapter Boards attached. This wiring configuration shows three PLC Communications Adapter Boards attached to the PLC Communications Adapter Board in RIO scanner mode to show the wiring connections you would need.

DH+ Configuration

When you configure a communications channel for DH+ communications, the PLC Communications Adapter Board becomes a station on the DH+ link. You can pass information to and from the drive using the DH+ protocol.

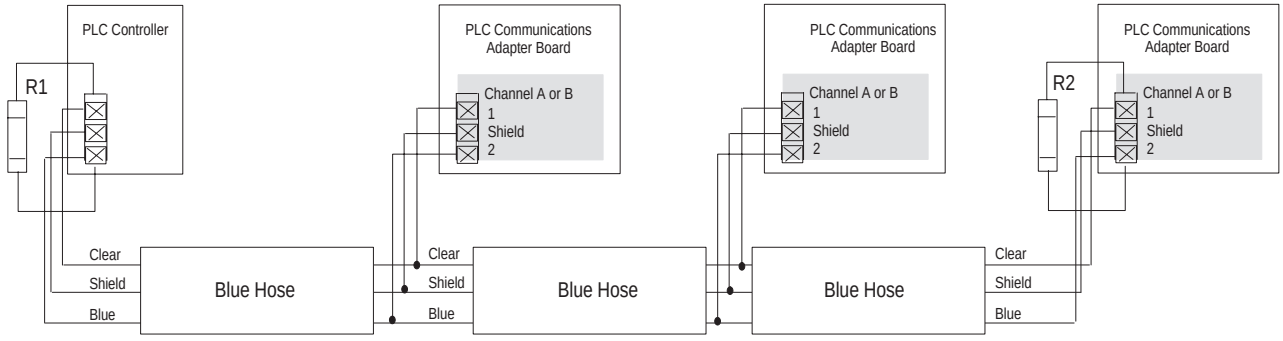
When configured for DH+ communications, the PLC Communications Adapter Board can:

- Support 57.6K, 115K, or 230K baud communication rates.
- Support read or write messages for blocks of parameters.
- Allow the PLC to to issue 1336 FORCE messages using a method similar to RIO block transfer.

The terminating resistors (R1 and R2 in the figure below) depend on the baud rate:

If you are using this baud rate:	Then, you need to use this terminating resistor:
57.6K	150 Ohm
115K	150 Ohm
230K	82 Ohm

The following is the wiring configuration necessary for DH+:



Starting Up

Chapter Objectives

Chapter 2 provides the following information:

- setting the DIP switches to configure channels A and B
- setting up the analog I/O
- a description of the SCANport capabilities
- a description of the pre–configured links

Setting the DIP Switches

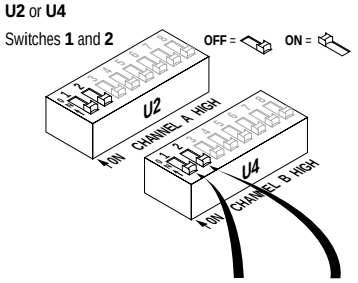
The PLC Communications Adapter Board contains four switches that you use to select the communications options for each channel. Use switches U2 and U3 to configure channel A and switches U4 and U5 to configure channel B. The standard configuration is to configure channel A for DH+ and channel B for RIO adapter. Changes to switch settings will not take effect until power is re–applied.

ATTENTION: Use a blunt, pointed instrument (such as a ball point pen) to set DIP switches. Do not use a pencil. Pencil lead (graphite) may damage switch assemblies.

ATTENTION: The PLC Communications Adapter Board uses both input and output image table words for drive control. The PLC Communications Adapter Board is not compatible with complementary I/O configurations. Failure to check connections and switch settings for application compatibility when configuring the PLC Communications Adapter Board could result in personal injury and /or equipment damage due to unintended or undesirable drive or process equipment operation.

The start up procedure for the PLC Communications Adapter Board depends on the communications protocol that you are using. Regardless of which protocol you are using, you need to set the protocol and baud rate. Once you have set the protocol and baud rate, follow the procedure for the protocol you chose for that channel (A or B).

If you encounter any operating faults once switch settings have been applied, refer to Chapter 8, *Troubleshooting*.

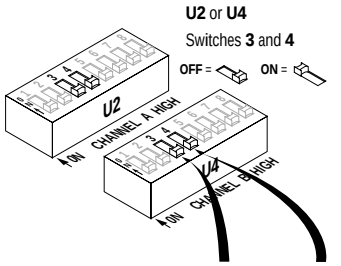


	SW1	SW2
RIO without Block Transfer	Off	Off
RIO with Block Transfer	Off	On
DH+	On	Off
RIO Scanner	On	On

Setting Your Protocol

Use the following chart to set switches 1 and 2 on either U2 or U4 to specify your protocol.

If you are using:	Then set SW1 to:	And SW2 to:
RIO without block transfer	Off	Off
RIO with block transfer	Off	On
DH+	On	Off
RIO scanner mode	On	On



Baud Rate	SW3	SW4
57.6K	Off	Off
115.2K	Off	On
230.4K	On	Off
230.4K	On	On

Setting Your Baud Rate

Use the following chart to set switches 3 and 4 on either U2 or U4 to specify the baud rate that you want to use.

If you want to communicate at:	Then set SW3 to:	And SW4 to:
57.6K	Off	Off
115.2K	Off	On
230.4K	On	Off/On

Once you have set the protocol and baud rate DIP switches, you should go to the section appropriate to your protocol:

If you selected this protocol:	Go to this page:
RIO with or without block transfer	Page 2–3
DH+	Page 2–8
RIO scanner mode	Page 2–6

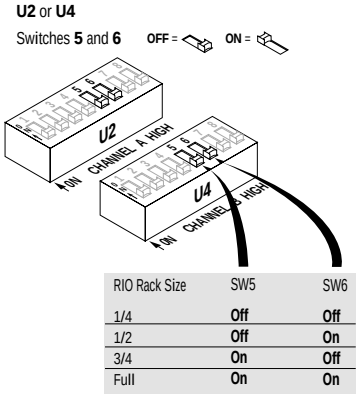
Configuring the RIO Adapter Protocol

If you are using the the RIO adapter protocol, you need to follow these steps once you have set the protocol and baud rate:

- specify the rack size
- specify the channel position
- specify whether you are using redundant RIO
- select the RIO starting group
- set the RIO rack address

Specifying the Rack Size

Use the following chart to set switches 5 and 6 on either U2 or U4 to specify the rack size.

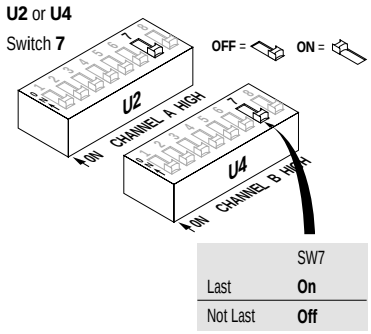


RIO Rack Size	SW5	SW6
1/4	Off	Off
1/2	Off	On
3/4	On	Off
Full	On	On

If your PLC communications only requires:	Then select:	By setting SW5 to:	And SW6 to:
1 word of I/O if block transfer is selected. 2 words of I/O if block transfer is not selected.	1/4 rack	Off	Off
3 words of I/O if block transfer is selected. 4 words of I/O if block transfer is not selected.	1/2 rack	Off	On
5 words of I/O if block transfer is selected. 6 words of I/O if block transfer is not selected.	3/4 rack	On	Off
7 words of I/O if block transfer is selected. 8 words of I/O if block transfer is not selected.	Full rack	On	On

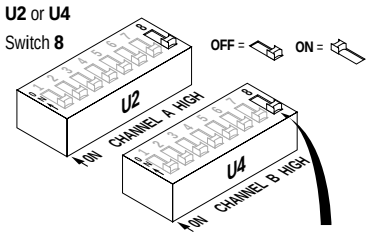
Specifying the Last/Not Last Group Scanned in Rack

Use the following chart to set switch 7 on either U2 or U4 to specify whether this channel contains the highest module groups that will be scanned in this rack.



	SW7
Last	On
Not Last	Off

Does this channel contain the highest module groups that will be scanned in this rack? If:	Then set SW7 to:
Yes	On
No	Off



Redundant RIO	SW8
Yes	**On**
No	**Off**

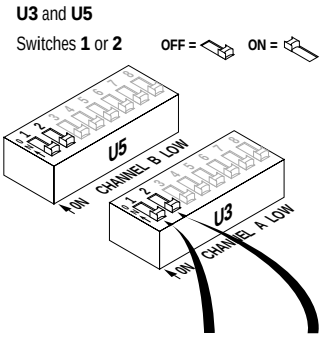
Specifying Whether You Are Using Redundant RIO

Use the following chart to set switch 8 on either U2 or U4.

Are you using redundant RIO mode? If:	Then set SW8 to:
Yes	On
No	Off

If you are using redundant RIO mode, make sure that both channels have the same RIO configuration (protocol selection and rack size). If you do not use the same rack size and protocol for both channels, you will get a fault.

For more information about redundant RIO, refer to Chapter 3, *Using Remote I/O Communications*.



Starting Module Group	SW1	SW2
0	**Off**	**Off**
2	**Off**	**On**
4	**On**	**Off**
6	**On**	**On**

Selecting the RIO Starting Group

Use the following chart to set switches 1 and 2 on either U3 or U5 to specify the rack starting group.

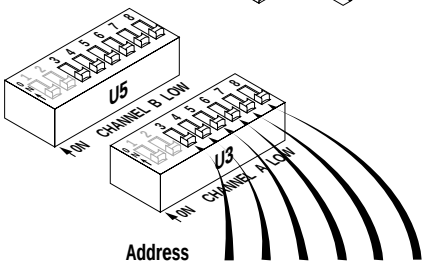
If the starting group must be:	Set SW1 to:	And SW2 to:
Group 0	Off	Off
Group 2	Off	On
Group 4	On	Off
Group 6	On	On

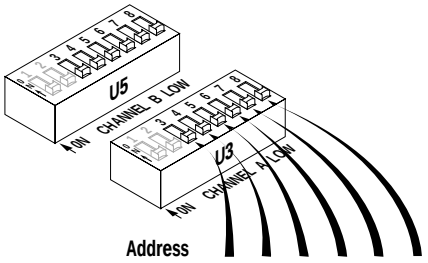
Setting the RIO Rack Address

Use the following chart to set switches 3 through 8 on either U3 or U5 to specify the RIO rack address.

U3 or **U5**

Switches **3** through **8** OFF = ON =





Address						
01	Off	Off	Off	Off	Off	On
02	Off	Off	Off	Off	On	Off
03	Off	Off	Off	Off	On	On
04	Off	Off	Off	On	Off	Off
05	Off	Off	Off	On	Off	On
06	Off	Off	Off	On	On	Off
07	Off	Off	Off	On	On	On
10	Off	Off	On	Off	Off	Off
11	Off	Off	On	Off	Off	On
12	Off	Off	On	Off	On	Off
13	Off	Off	On	Off	On	On
14	Off	Off	On	On	Off	Off
15	Off	Off	On	On	Off	On
16	Off	Off	On	On	On	Off
17	Off	Off	On	On	On	On
20	Off	On	Off	Off	Off	Off
21	Off	On	Off	Off	Off	On
22	Off	On	Off	Off	On	Off
23	Off	On	Off	Off	On	On
24	Off	On	Off	On	Off	Off
25	Off	On	Off	On	Off	On
26	Off	On	Off	On	On	Off
27	Off	On	Off	On	On	On
30	Off	On	On	Off	Off	Off
31	Off	On	On	Off	Off	On
32	Off	On	On	Off	On	Off
33	Off	On	On	Off	On	On
34	Off	On	On	On	Off	Off
35	Off	On	On	On	Off	On
36	Off	On	On	On	On	Off
37	Off	On	On	On	On	On

Address						
40	On	Off	Off	Off	Off	Off
41	On	Off	Off	Off	Off	On
42	On	Off	Off	Off	On	Off
43	On	Off	Off	Off	On	On
44	On	Off	Off	On	Off	Off
45	On	Off	Off	On	Off	On
46	On	Off	Off	On	On	Off
47	On	Off	Off	On	On	On
50	On	Off	On	Off	Off	Off
51	On	Off	On	Off	Off	On
52	On	Off	On	Off	On	Off
53	On	Off	On	Off	On	On
54	On	Off	On	On	Off	Off
55	On	Off	On	On	Off	On
56	On	Off	On	On	On	Off
57	On	Off	On	On	On	On
60	On	On	Off	Off	Off	Off
61	On	On	Off	Off	Off	On
62	On	On	Off	Off	On	Off
63	On	On	Off	Off	On	On
64	On	On	Off	On	Off	Off
65	On	On	Off	On	Off	On
66	On	On	Off	On	On	Off
67	On	On	Off	On	On	On
70	On	On	On	Off	Off	Off
71	On	On	On	Off	Off	On
72	On	On	On	Off	On	Off
73	On	On	On	Off	On	On
74	On	On	On	On	Off	Off
75	On	On	On	On	Off	On
76	On	On	On	On	On	Off
77	On	On	On	On	On	On

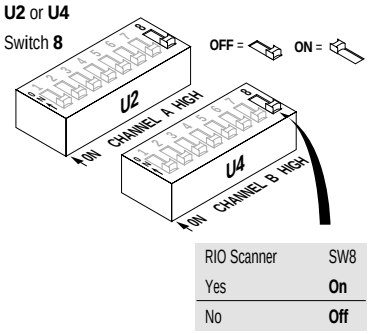
Configuring the RIO Scanner Protocol

If you are using the RIO scanner protocol, you need to follow these steps once you have set the protocol and baud rate:

- specify the size of the rack (up to one full rack) to scan
- set the rack configuration

Chapter 3, *Using Remote I/O Communications*, provides additional information about the RIO scanner protocol.

Specifying Whether One Full Rack Is Being Scanned

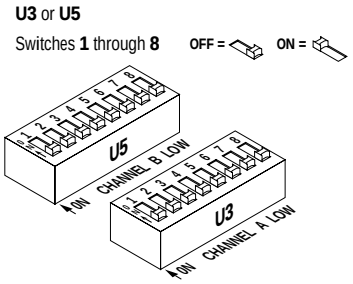


RIO Scanner	SW8
Yes	**On**
No	**Off**

Use the following chart to set switch 8 on either U2 or U4.

Is RIO scanner scanning one full rack (instead of portions that total a full rack)? If:	Then set SW8 to:
Yes	On
No	Off

If you set switch 8 to On, you do not need to set the switches for U3 or U5.



For each pair of switches

Not Used	Off	Off
1/4 Rack	Off	On
1/2 Rack	On	Off
3/4 Rack	On	On

Setting the Rack Configuration

To set the switches on either U3 or U5 to specify the rack configuration for RIO scanner, you need to first determine how you want to set up the logical RIO rack (that is, the rack size(s) and their respective module group). For example, if you want RIO scanner to scan one 1/4 rack and one 1/2 rack, you need to decide what the starting module groups will be for both racks (0, 2, 4, or 6).

The DIP switches for the rack configuration work as pairs. One pair of switches designates a 1/4 rack. If you use a 1/2 rack, you need to use two pairs of switches, or four switches. Likewise, if you use a 3/4 rack, you need to use three pairs of switches, or six switches.

Use the following chart to set the DIP switches for your specific configuration. Quarter 4 through quarter 1 represent the quarter racks that make up one full rack.

Quarter 4	Quarter 3	Quarter 2	Quarter 1	DIP Switches U3 or U5							
			1/4	Off	Off	Off	Off	Off	Off	Off	On
		1/4		Off	Off	Off	Off	Off	On	Off	Off
	1/4			Off	Off	Off	On	Off	Off	Off	Off
1/4				Off	On	Off	Off	Off	Off	Off	Off
		1/4	1/4	Off	Off	Off	Off	Off	On	Off	On
	1/4		1/4	Off	Off	Off	On	Off	Off	Off	On
1/4			1/4	Off	On	Off	Off	Off	Off	Off	On

Quarter 4	Quarter 3	Quarter 2	Quarter 1	DIP Switches U3 or U5							
	1/4	1/4		Off	Off	Off	On	Off	On	Off	Off
1/4		1/4		Off	On	Off	Off	Off	On	Off	Off
1/4	1/4			Off	On	Off	On	Off	Off	Off	Off
	1/4	1/4	1/4	Off	Off	Off	On	Off	On	Off	On
1/4		1/4	1/4	Off	On	Off	Off	Off	On	Off	On
1/4	1/4		1/4	Off	On	Off	On	Off	Off	Off	On
1/4	1/4	1/4		Off	On	Off	On	Off	On	Off	Off
1/4	1/4	1/4	1/4	Off	On	Off	On	Off	On	Off	On
		1/2		Off	Off	Off	Off	On	Off	On	Off
	1/2			Off	Off	On	Off	On	Off	Off	Off
1/2				On	Off	On	Off	Off	Off	Off	Off
1/2		1/2		On	Off	On	Off	On	Off	On	Off
	3/4			Off	Off	On	On	On	On	On	On
3/4				On	On	On	On	On	On	On	On
FULL				Not Applicable							
3/4			1/4	On	On	On	On	On	On	Off	On
1/4	3/4			Off	On	On	On	On	On	On	On
1/2		1/4		On	Off	On	Off	Off	On	Off	Off
1/2			1/4	On	Off	On	Off	Off	Off	Off	On
1/2		1/4	1/4	On	Off	On	Off	Off	On	Off	On
1/4	1/2			Off	On	On	Off	On	Off	Off	Off
	1/2		1/4	Off	Off	On	Off	On	Off	Off	On
1/4	1/2		1/4	Off	On	On	Off	On	Off	Off	On
1/4		1/2		Off	On	Off	Off	On	Off	On	Off
	1/4	1/2		Off	Off	Off	On	On	Off	On	Off
1/4	1/4	1/2		Off	On	Off	On	On	Off	On	Off

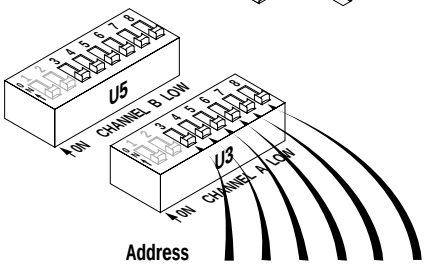
Configuring the DH+ Protocol

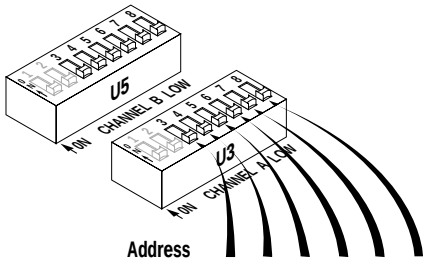
If you are using the DH+ protocol, you need to set the DH+ station address once you have set the protocol and baud rate.

Use the following chart to set switches 3 through 8 on either U3 or U5 to specify the DH+ station address.

U3 or **U5**

Switches **3** through **8** OFF = ON =





Address						
00	Off	Off	Off	Off	Off	Off
01	Off	Off	Off	Off	Off	On
02	Off	Off	Off	Off	On	Off
03	Off	Off	Off	Off	On	On
04	Off	Off	Off	On	Off	Off
05	Off	Off	Off	On	Off	On
06	Off	Off	Off	On	On	Off
07	Off	Off	Off	On	On	On
10	Off	Off	On	Off	Off	Off
11	Off	Off	On	Off	Off	On
12	Off	Off	On	Off	On	Off
13	Off	Off	On	Off	On	On
14	Off	Off	On	On	Off	Off
15	Off	Off	On	On	Off	On
16	Off	Off	On	On	On	Off
17	Off	Off	On	On	On	On
20	Off	On	Off	Off	Off	Off
21	Off	On	Off	Off	Off	On
22	Off	On	Off	Off	On	Off
23	Off	On	Off	Off	On	On
24	Off	On	Off	On	Off	Off
25	Off	On	Off	On	Off	On
26	Off	On	Off	On	On	Off
27	Off	On	Off	On	On	On
30	Off	On	On	Off	Off	Off
31	Off	On	On	Off	Off	On
32	Off	On	On	Off	On	Off
33	Off	On	On	Off	On	On
34	Off	On	On	On	Off	Off
35	Off	On	On	On	Off	On
36	Off	On	On	On	On	Off
37	Off	On	On	On	On	On

Address						
40	On	Off	Off	Off	Off	Off
41	On	Off	Off	Off	Off	On
42	On	Off	Off	Off	On	Off
43	On	Off	Off	Off	On	On
44	On	Off	Off	On	Off	Off
45	On	Off	Off	On	Off	On
46	On	Off	Off	On	On	Off
47	On	Off	Off	On	On	On
50	On	Off	On	Off	Off	Off
51	On	Off	On	Off	Off	On
52	On	Off	On	Off	On	Off
53	On	Off	On	Off	On	On
54	On	Off	On	On	Off	Off
55	On	Off	On	On	Off	On
56	On	Off	On	On	On	Off
57	On	Off	On	On	On	On
60	On	On	Off	Off	Off	Off
61	On	On	Off	Off	Off	On
62	On	On	Off	Off	On	Off
63	On	On	Off	Off	On	On
64	On	On	Off	On	Off	Off
65	On	On	Off	On	Off	On
66	On	On	Off	On	On	Off
67	On	On	Off	On	On	On
70	On	On	On	Off	Off	Off
71	On	On	On	Off	Off	On
72	On	On	On	Off	On	Off
73	On	On	On	Off	On	On
74	On	On	On	On	Off	Off
75	On	On	On	On	Off	On
76	On	On	On	On	On	Off
77	On	On	On	On	On	On

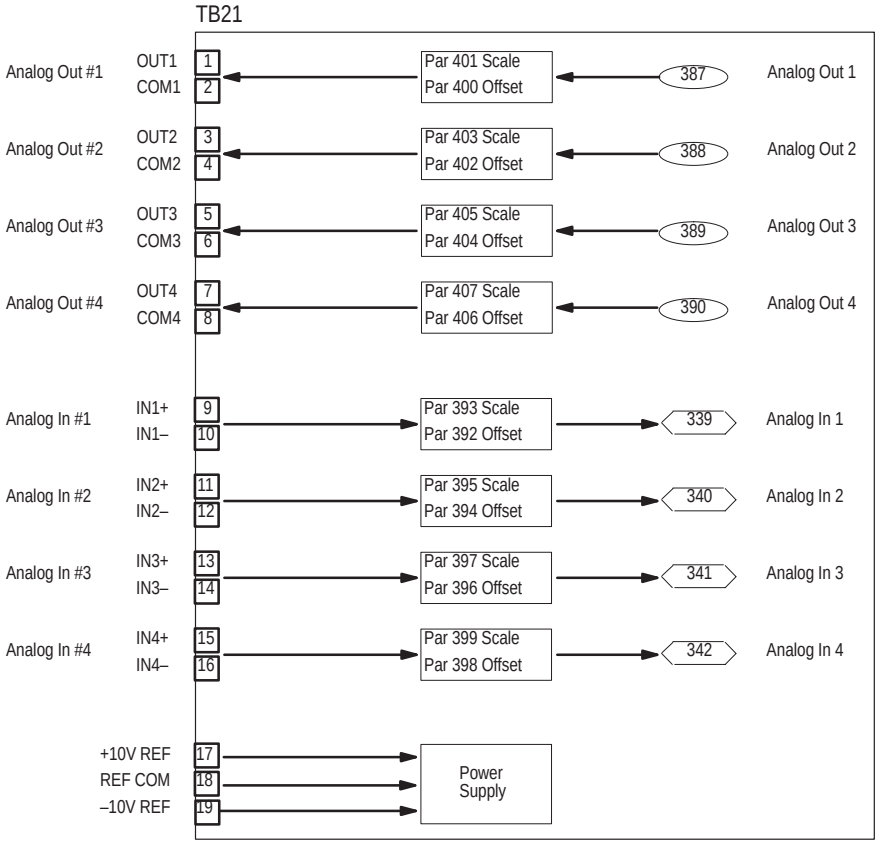
Setting Up the Analog I/O

Before you can transfer data between the PLC Communications Adapter Board and the analog I/O, you need to do the following:

1. Hard wire the analog I/O to the PLC Communications Adapter Board terminals.
2. Set up the analog input and output configuration parameters in the drive.
3. Create any user links, if appropriate.

Note: The PLC Communications Adapter Board has been pre–configured for your convenience. The pre–configured links are listed later in this chapter.

Each terminal has parameters associated with it as shown here in the analog I/O block diagram.



Use the set up parameters to program the PLC Communications Adapter Board functions. The following parameters are used for set up:

Parameter number:	Parameter name:	These parameters determine the:
392, 394, 396, 398	Analog Input Offset	Offset applied to the raw Analog Input values before the scale factor is applied.
393, 395, 397, 399	Analog Input Scale	Scale factor or gain for Analog Input values.
400, 402, 404, 406	Analog Output Offset	Offset applied to the Analog Output values after the scale factor is applied.
401, 403, 405, 407	Analog Output Scale	Scale factor or gain for Analog Input values.

Configuration parameters allow the PLC Communications Adapter Board to communicate with the drive. You need to link the configuration parameters to parameters in the drive. The following are the analog input and output configuration parameters:

Parameter number:	Parameter name:	These parameters are the:
339 – 342	Analog Input	Source parameters that are the result of converting a +10V signal to a +32767 value using the associated scale and offset parameters.
387 – 390	Analog Output	Sink parameters used to convert +32767 values to a +10V signal.

Each analog input and output is associated with a scaling and offset set up parameter. You must adjust these parameters for each analog device.

The drive works with internal drive units. Each parameter is a 16–bit word that allows a range of ±32767 internal units. The drive is scaled so that 4096 is equal to one unit or 100% of the quantity being regulated. A ±10V dc signal applied to an analog input is converted to a digital value of ±2048, providing a total range of 4096. When calibrating analog inputs, a scale factor is applied to this value to provide an effective range of ±32767 (16 × 2048). The offset parameter determines the offset in volts, applied to the raw analog value before the scale factor is applied. This allows you to shift the range of the analog input by ±4096 drive units (±20 volts).

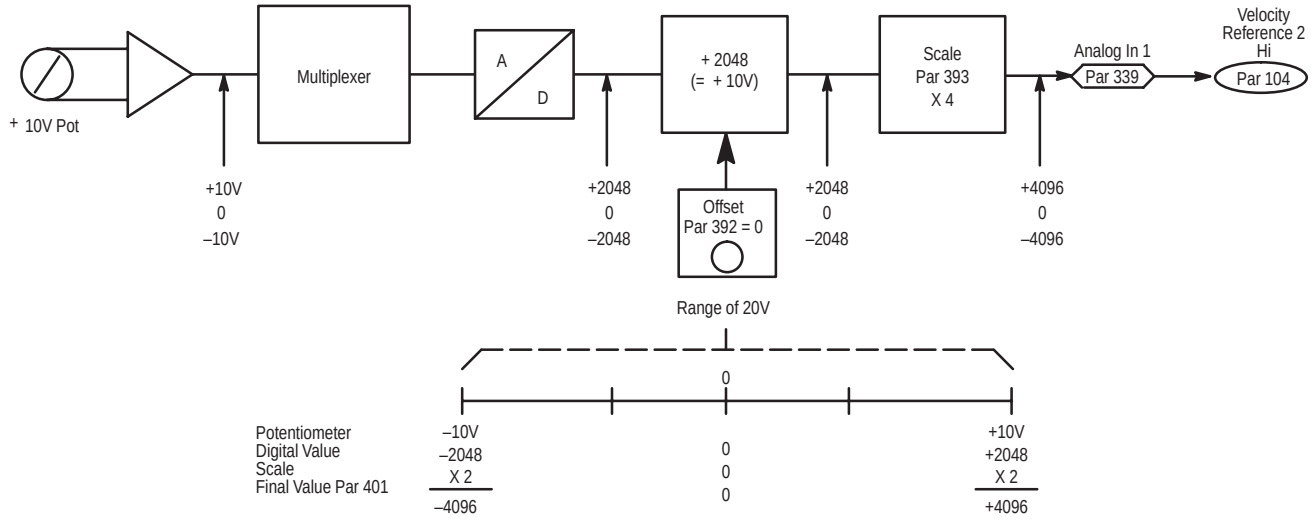
Understanding the Scale and Offset Parameters for Input

Analog Input 1 and Analog Input 2 are used in explaining the scale and offset parameters. At Analog Input 1, between TB21 terminals 9 and 10, a potentiometer with a range of ±10V dc has been connected. Analog Input 1 has been linked to Velocity Reference (parameter 101) in the drive, which gives the potentiometer control of the external velocity reference.

To calibrate the pot to control 100% base speed in both directions, you need to adjust the scale parameter. The default value of the scale parameters allows a total range of 4096, –2048 to +2048. This allows only 50% base speed in each direction. By setting a scale factor of 2 in Analog Input 1 Scale, the digital input is multiplied by 2. This provides a range of ±4096, or 100% base speed in both directions.

If you want a range of ± 2 times base speed, the scale factor would be 4 (base speed is 4096, 2 times base speed is 8192, 2048 times 4 is 8192). Analog Input 1 Offset remains at the default value of zero, allowing the input range to be ±10V. The range of the offset parameter is ± 20V dc as shown in Figure 2–1.

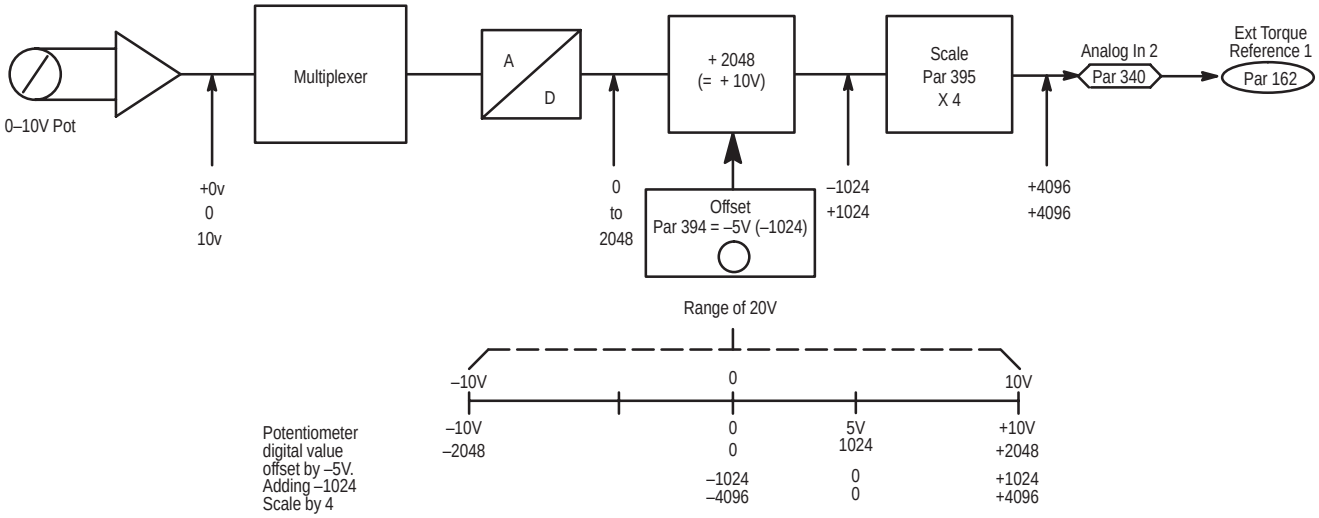
Figure 2.1
Potentiometer with +10V Range to Control 0 to +100% Base Speed



For Analog Input 2, a 0 to 10 volt potentiometer is used to adjust the Torque Reference from –100% to +100%. To do this, you need to adjust both the scale and offset parameters. By linking Analog Input 2 to Torque Reference (parameter 162), the potentiometer connected to Analog Input 2 becomes the Torque Reference Signal. This signal must be scaled and offset to get the entire ±100% in the 0 through 10 volt range. A digital range of 8192 (±4096) must now be scaled for an analog range of 10 volts, and must be offset so 5 volts on the potentiometer indicates 0% Torque.

As shown in Figure 2–2, the offset voltage adds the corresponding digital value to the range. In this case, an offset of –5 volts adds a digital value of –1024 to the range. This causes 0 volts on the potentiometer to register as –1024 digital internal to the drive and 10 volts on the potentiometer will be +1024 to the drive. This can then be scaled by a factor of 4 (8192 drive units) so that 0 volts sends a digital value of –4096 for –100% torque, and 10 volts sends a digital value of +4096 for +100% torque.

Figure 2.2
Potentiometer 0–10V Range to Control +100% Torque Reference



Understanding the Scale and Offset Parameters for Output

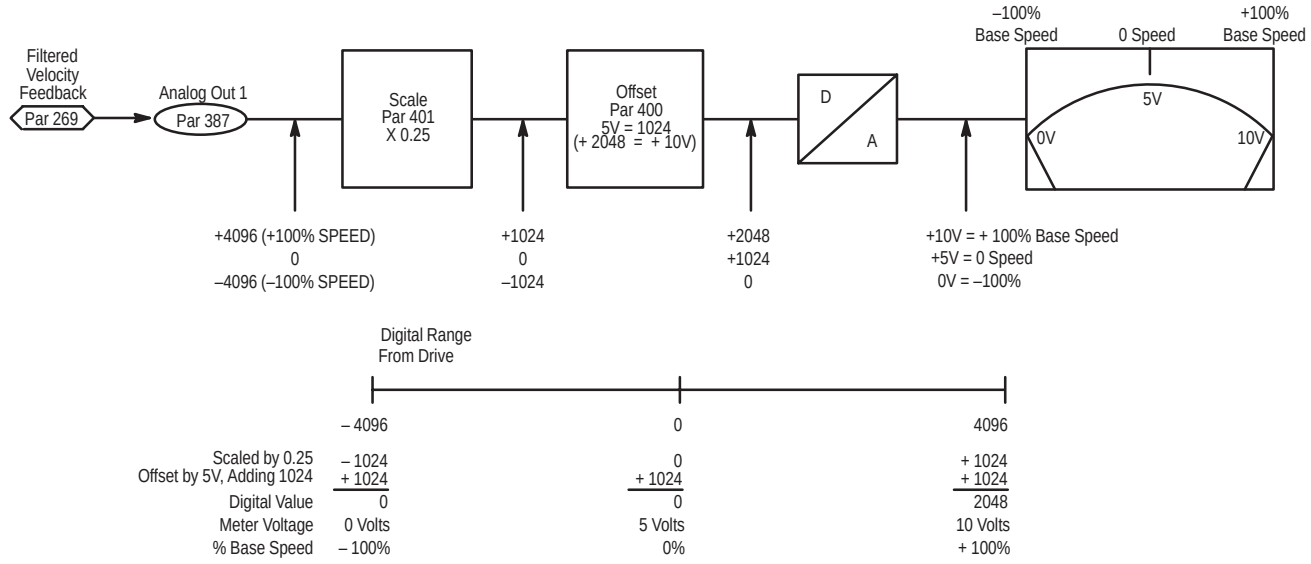
Analog outputs are similar to analog inputs. Each output has a scale and offset parameter, along with a specific variable parameter used for linking. Differences occur because of the direction of information flow. The drive sends a digital value in drive units, which must be matched to the voltage of the monitoring device. Similar to analog inputs, the analog output converts a ±2048 value to ±10V dc. Thus, when the drive sends ±100% base speed (equal to ±4096), it must be scaled by 0.5 to be in the proper range (±4096 × 0.5 = ±2048). The offset can be ±20V dc, even though the physical limit is ±10V dc. This allows you to offset the signal anywhere within the entire range.

In Figure 2–3, Analog Output 1 is used as an example to show the scale and offset parameters. At Analog Output 1, a meter with a range of 0 through 10V dc has been connected. Analog Output 1 has been linked to Velocity Feedback (parameter 269).

For the meter to indicate speed in both directions, you need to adjust the scale and offset parameters as shown in Figure 2–3. Working in the opposite direction as the analog inputs, apply the scale factor first. The drive sends a ±4096 digital value to indicate ±100% velocity feedback for a total digital range of 8192. The meter, having an analog range of 0 through 10V dc, requires a digital range of 2048. This is done by applying a scale factor of 0.25 (8192 × 0.25 = 2048).

To have the 0 through 10V dc meter indicate ±100% feedback, you need to apply an offset. Offset parameters for analog outputs will again add the corresponding digital value to the range. In this case, an offset of 5 volts adds a digital value of 1024 to the range. This allows full range deflection on the 0 to 10 volt meter, with 5 volts indicating zero speed.

Figure 2.3
Analog Output 1 +100% Speed Indication



Using the SCANport Capabilities

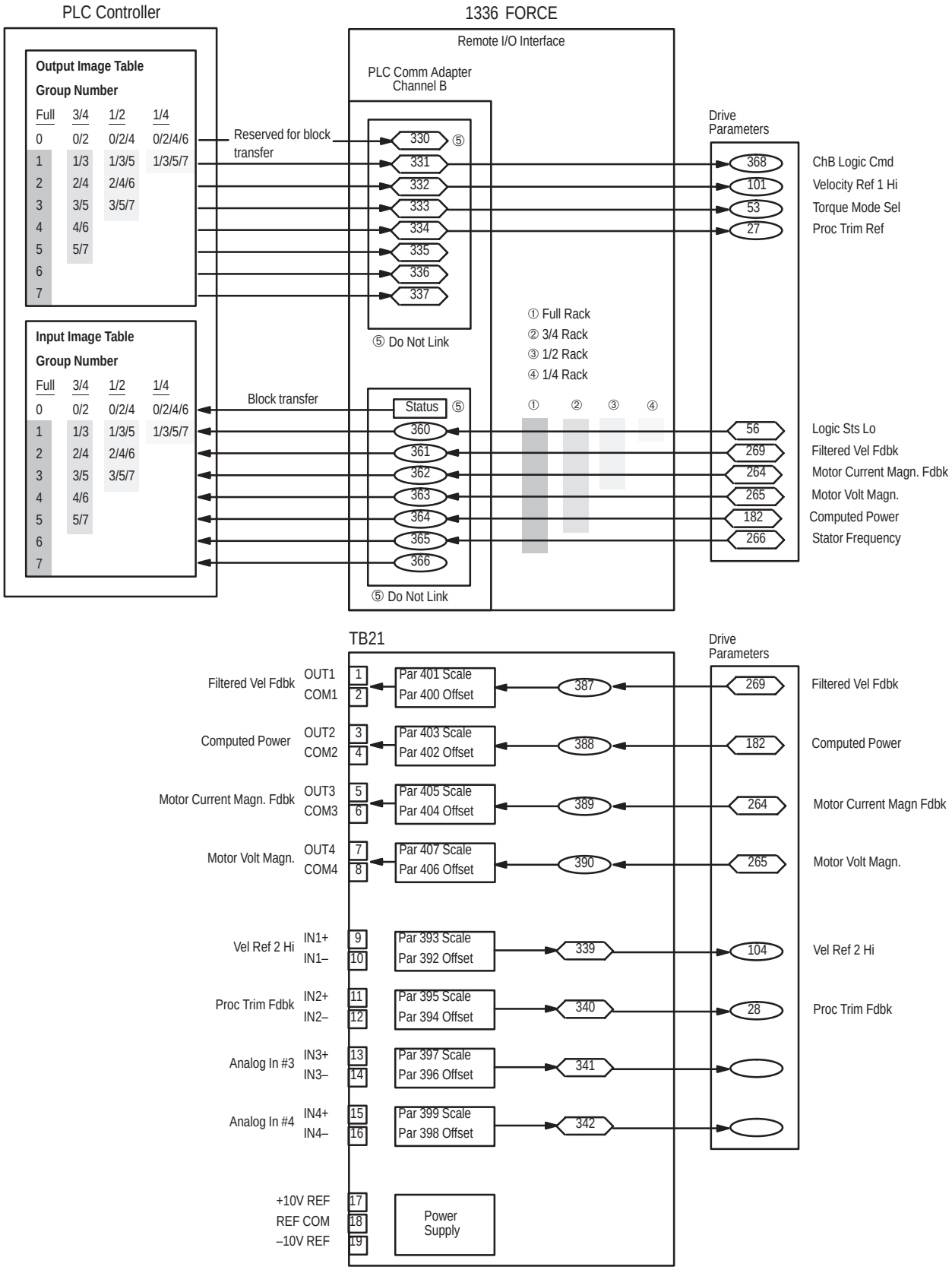
To communicate with external devices such as terminals, the PLC Communications Adapter Board uses the SCANport communications protocol. You can access the SCANport capabilities without doing any special configuration. However, if you plan to use SCANport, you can make some changes to the default configuration to customize the way SCANport works for you. Chapter 5, *Understanding the Resources of Your Drive*, contains information about SCANport and how you can change the default configuration.

Pre–Configured Links

The PLC Communications Adapter Board is shipped pre-configured. The pre-configured (default) links assume channel A is defined for DH+ and channel B for RIO. Some of the inputs and outputs to the board are linked to a pre–defined signal. Figure 2–4 shows the 1336 FORCE standard configuration for the PLC Communications Adapter Board. You can change this and re–configure the drive on a per-application basis.

Note: When a link is set up, the data is transferred from the configured source to a sink every millisecond.

Figure 2.4
PLC Communications Adapter Board Configuration
Example––Pre–Configured Links: Channel A is DH+, Channel B is RIO


PLC Controller
1336 FORCE
Remote I/O Interface
PLC Comm Adapter Channel B
Output Image Table
Group Number
Full 3/4 1/2 1/4
0 0/2 0/2/4 0/2/4/6
1 1/3 1/3/5 1/3/5/7
2 2/4 2/4/6
3 3/5 3/5/7
4 4/6
5 5/7
6
7
Reserved for block transfer
330 ⑤
331
332
333
334
335
336
337
⑤ Do Not Link
Drive Parameters
368 ChB Logic Cmd
101 Velocity Ref 1 Hi
53 Torque Mode Sel
27 Proc Trim Ref
① Full Rack
② 3/4 Rack
③ 1/2 Rack
④ 1/4 Rack
Input Image Table
Group Number
Full 3/4 1/2 1/4
0 0/2 0/2/4 0/2/4/6
1 1/3 1/3/5 1/3/5/7
2 2/4 2/4/6
3 3/5 3/5/7
4 4/6
5 5/7
6
7
Block transfer
Status ⑤
360
361
362
363
364
365
366
⑤ Do Not Link
① ② ③ ④
56 Logic Sts Lo
269 Filtered Vel Fdbk
264 Motor Current Magn. Fdbk
265 Motor Volt Magn.
182 Computed Power
266 Stator Frequency
TB21
Drive Parameters
Filtered Vel Fdbk OUT1 1 COM1 2 Par 401 Scale Par 400 Offset 387 269 Filtered Vel Fdbk
Computed Power OUT2 3 COM2 4 Par 403 Scale Par 402 Offset 388 182 Computed Power
Motor Current Magn. Fdbk OUT3 5 COM3 6 Par 405 Scale Par 404 Offset 389 264 Motor Current Magn Fdbk
Motor Volt Magn. OUT4 7 COM4 8 Par 407 Scale Par 406 Offset 390 265 Motor Volt Magn.
Vel Ref 2 Hi IN1+ 9 IN1– 10 Par 393 Scale Par 392 Offset 339 104 Vel Ref 2 Hi
Proc Trim Fdbk IN2+ 11 IN2– 12 Par 395 Scale Par 394 Offset 340 28 Proc Trim Fdbk
Analog In #3 IN3+ 13 IN3– 14 Par 397 Scale Par 396 Offset 341
Analog In #4 IN4+ 15 IN4– 16 Par 399 Scale Par 398 Offset 342
+10V REF 17
REF COM 18
–10V REF 19
Power Supply

Using Remote I/O Communications

Chapter Objectives

This chapter provides information that can help you understand and use the remote I/O (RIO) communications. This chapter covers the following topics:

- understanding RIO communications
- transferring data using discrete data transfer
- transferring data using block transfer
- using RIO redundant mode
- using RIO scanner mode

Understanding RIO Communications

When you configure the PLC Communications Adapter Board for RIO communications, the drive looks like a remote I/O chassis to a PLC. This allows you to use either discrete message transfer or block transfer to communicate with the PLC.

With discrete message transfer, the PLC controller's I/O image table is used to transfer the data that the drive needs to have continuously updated.

With block transfer, data is sent between the drive and PLC controller when requested. Block transfer is the transfer of data, in blocks of data up to 64 words. For additional information about using block transfer routines, refer to your PLC user manual.

You can configure channel A, channel B, or both channels for Allen–Bradley RIO communications. The communications method that you choose (either RIO or DH+) determines which parameters for the PLC Communications Adapter Board are defined.

The following table identifies which parameters are defined when you select RIO communications.

Is Channel A defined for RIO?	Is Channel B defined for RIO?	Then, these parameters are defined:	And these parameters are not defined:
Yes	No	322–329, 351–358, 425, 426, 427①	330–337, 359–366, 427, 430–431
No	Yes	330–337, 359–366, 430, 431, 432②	322–329, 351–358, 425–427
Yes	Yes	322–337, 351–366, 425, 426, 427③	None
No	No	None	322–337, 351–366, 425–431

① Parameter 427 is defined only if channel A is set up for RIO scanner mode.

② Parameter 432 is defined only if channel B is set up for RIO scanner mode.

③ Parameter 427 is defined only if the redundant DIP switch is set and both channels have the same RIO adapter protocol and the same rack size.

Transferring Data Using Discrete Data Transfer

The drive requires that some data be continuously updated. This data is transferred using the PLC controller's I/O image table. This data is transferred from the drive to the PLC Communications Adapter Board every 1.5 milliseconds. The following table shows the timing information for discrete data transfer from the PLC Communications Adapter Board to the drive:

If you are transferring data at this baud rate:	The fastest the transfer can occur is:
57.6K	7.2 milliseconds
115.2K	3.6 milliseconds
230.4K	1.8 milliseconds

When you use discrete data transfer, you need to specify a rack size. With the PLC Communications Adapter Board, you can specify a 1/4 rack, a 1/2 rack, a 3/4 rack, or a full rack. The first group number associated with a rack is reserved for the block transfer function if it is selected with the RIO protocol (you should select the RIO protocol through DIP switches set up on the PLC Communications Adapter Board).

The remaining group numbers are used for transferring discrete data:

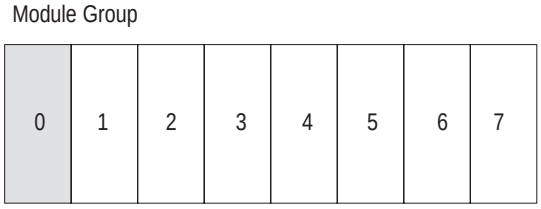
If you are using this rack size:	Then, these group numbers are available:
Full	1–7
3/4	1–5 or 3–7
1/2	1–3, 3–5, or 5–7
1/4	1, 3, 5, or 7

Each group number reserves a single 16–bit word in both the input and output image table of the PLC controller for the assigned rack number. In the drive, these words are directly linked to internal drive parameters using source and sink parameters.

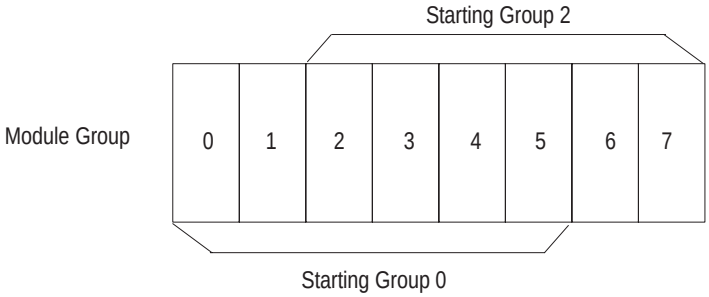
Important: If you select RIO with block transfer, the first RIO data word is reserved for block transfer. Linking to this data word causes the block transfer feature to be non–operative.

In the following descriptions, each module group appears to have a 16–bit input and output module installed.

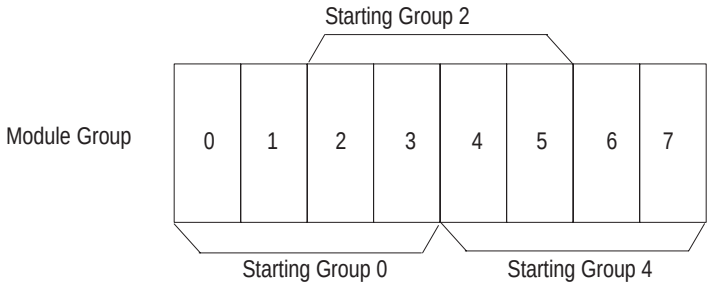
The following figure shows the RIO full rack configuration. Module group 0 is reserved for block transfer if you select RIO with the block transfer protocol.



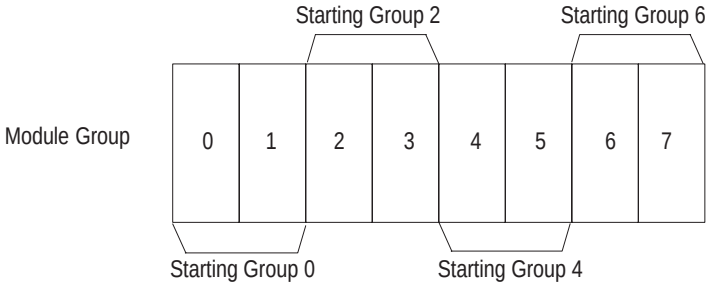
The following figure shows the RIO 3/4 rack configuration. If the 3/4 rack configuration starts at group 0 and you select RIO with the block transfer protocol, module group 0 is reserved for block transfer. If the 3/4 rack configuration starts at group 2 and you select RIO with the block transfer protocol, then module group 2 is reserved for block transfer.



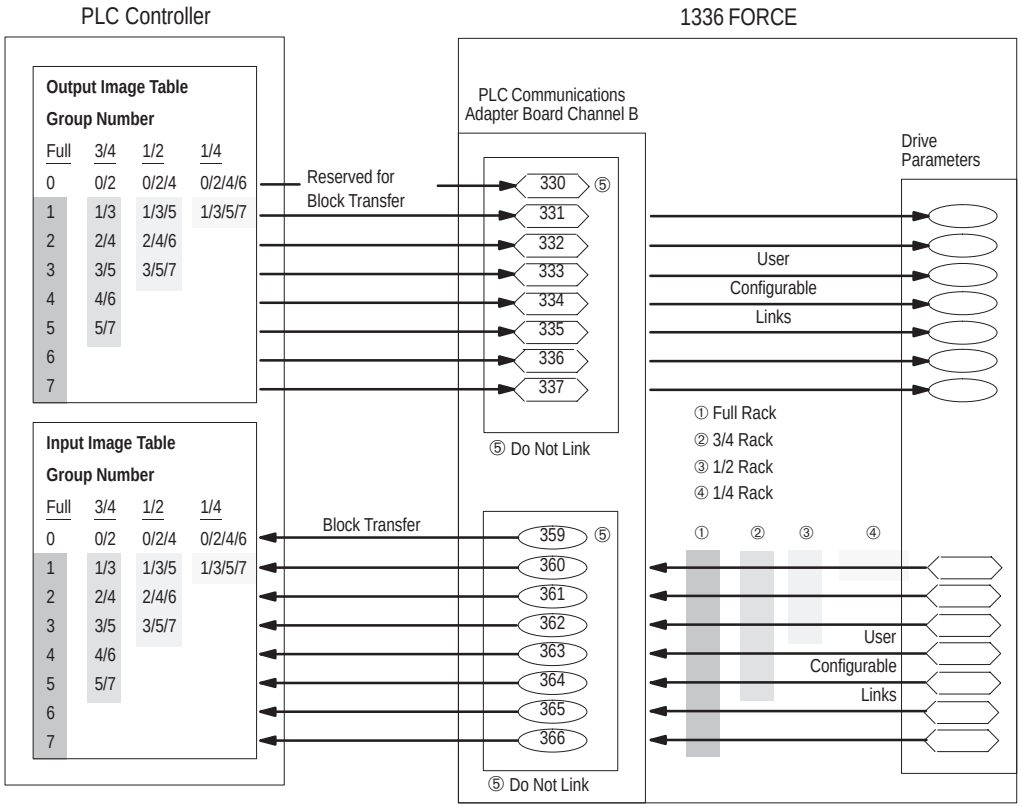
The following figure shows the RIO 1/2 rack configuration. With each configuration, the starting group module (0, 2, or 4) is reserved for block transfer if you select RIO with the block transfer protocol.



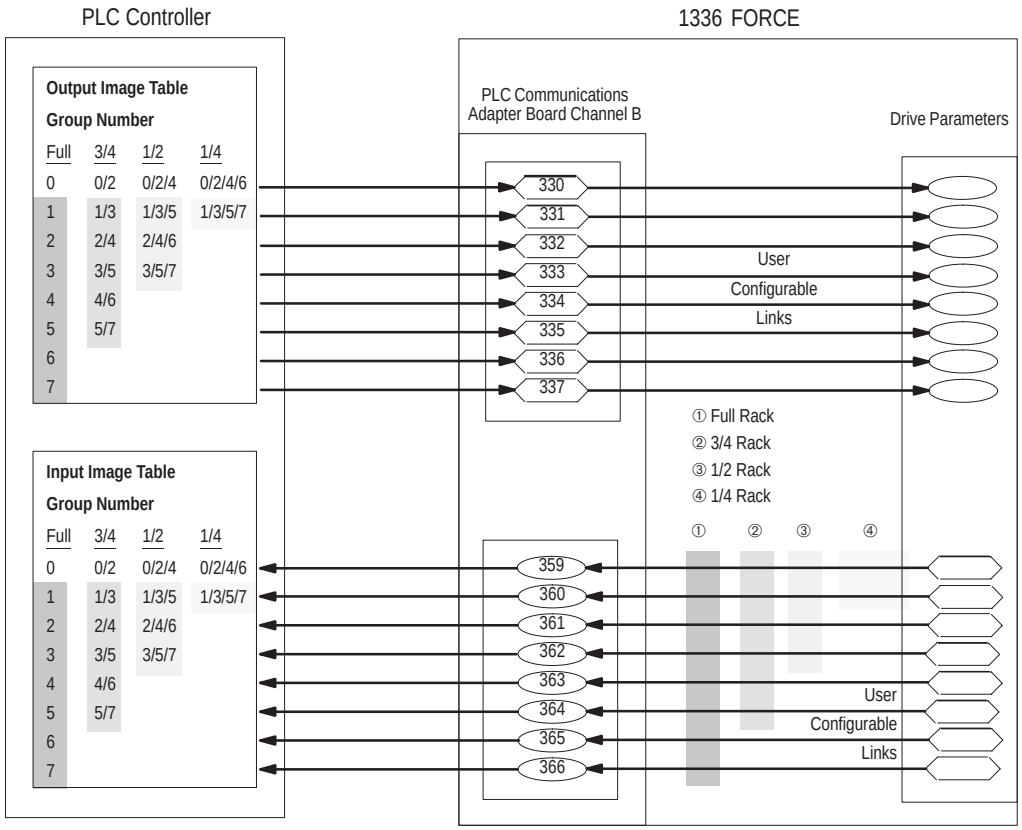
The following figure shows the RIO 1/4 rack configuration. With each configurations, the starting group module (0, 2, 4, or 6) is reserved for block transfer if you select RIO with the block transfer protocol.



The following figure shows an example of the PLC Communications Adapter Board that uses RIO communications with block transfer. Notice that the first module group number is reserved for block transfer.

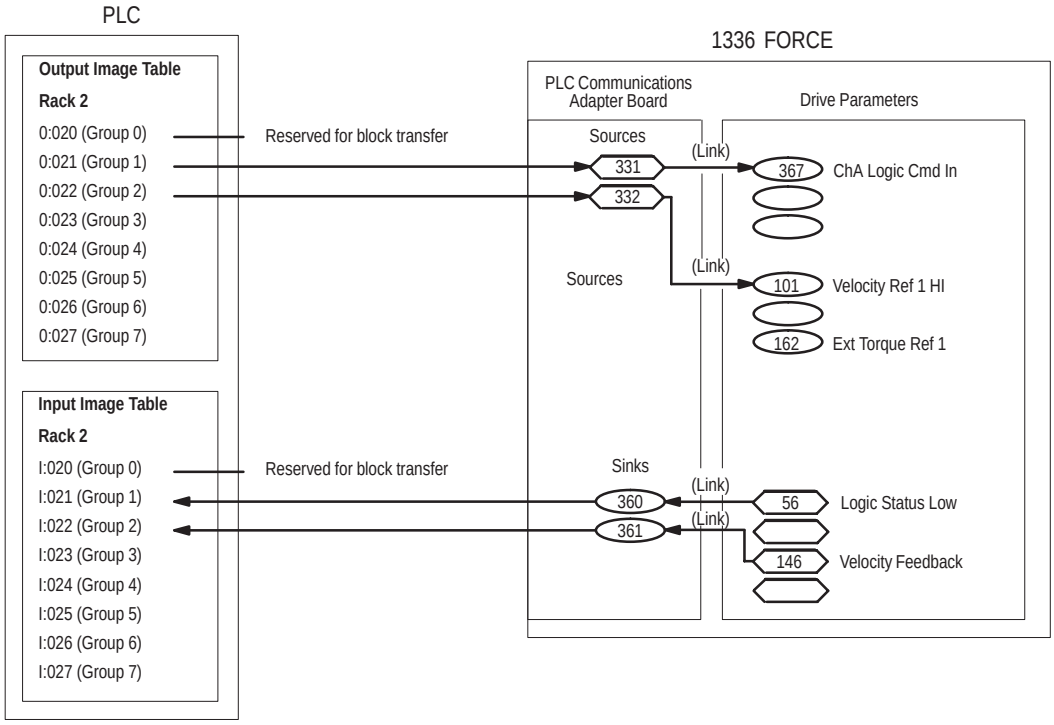


The following figure shows an example of the PLC Communications Adapter Board that uses RIO communications without block transfer. Notice that you can use the first module group number.



Discrete PLC Programming

The following figure shows an application where the PLC Communications Adapter Board has been set up for a full rack (numbered rack 2) and the PLC controller program is using the 16–bit words for groups 1 and 2 for data transfer with the 1336 FORCE. You should refer to this figure to help understand the following description.



In this example, the drive has been configured so that the data coming into source parameter 331 is linked to parameter 367, ChA Logic Cmd In. Information linked to the 1336 FORCE using the 16–bit output word for group 1 of rack 2 must be a 16–bit word where the bits are defined by the description of parameter 367.

Parameter 101, Velocity Ref 1 HI, has been linked to source parameter 332. The 16–bit output word for group 2 of rack 2 must be a 16–bit signed integer whose value is within the allowable range of values in drive units for parameter 101.

Information from the 1336 FORCE consists of parameter 56, Logic Status LOW, and parameter 146, Velocity Feedback. Based on the links shown, the 16–bit input word for group 1, rack 2 in the PLC controller is a 16–bit logic status word. The description for parameter 56 defines the bits in this 16–bit word. In addition, the 16–bit input for group 2, rack 2 in the PLC controller is a 16–bit signed integer whose value corresponds to the allowable values in drive units for parameter 146.

Scaling

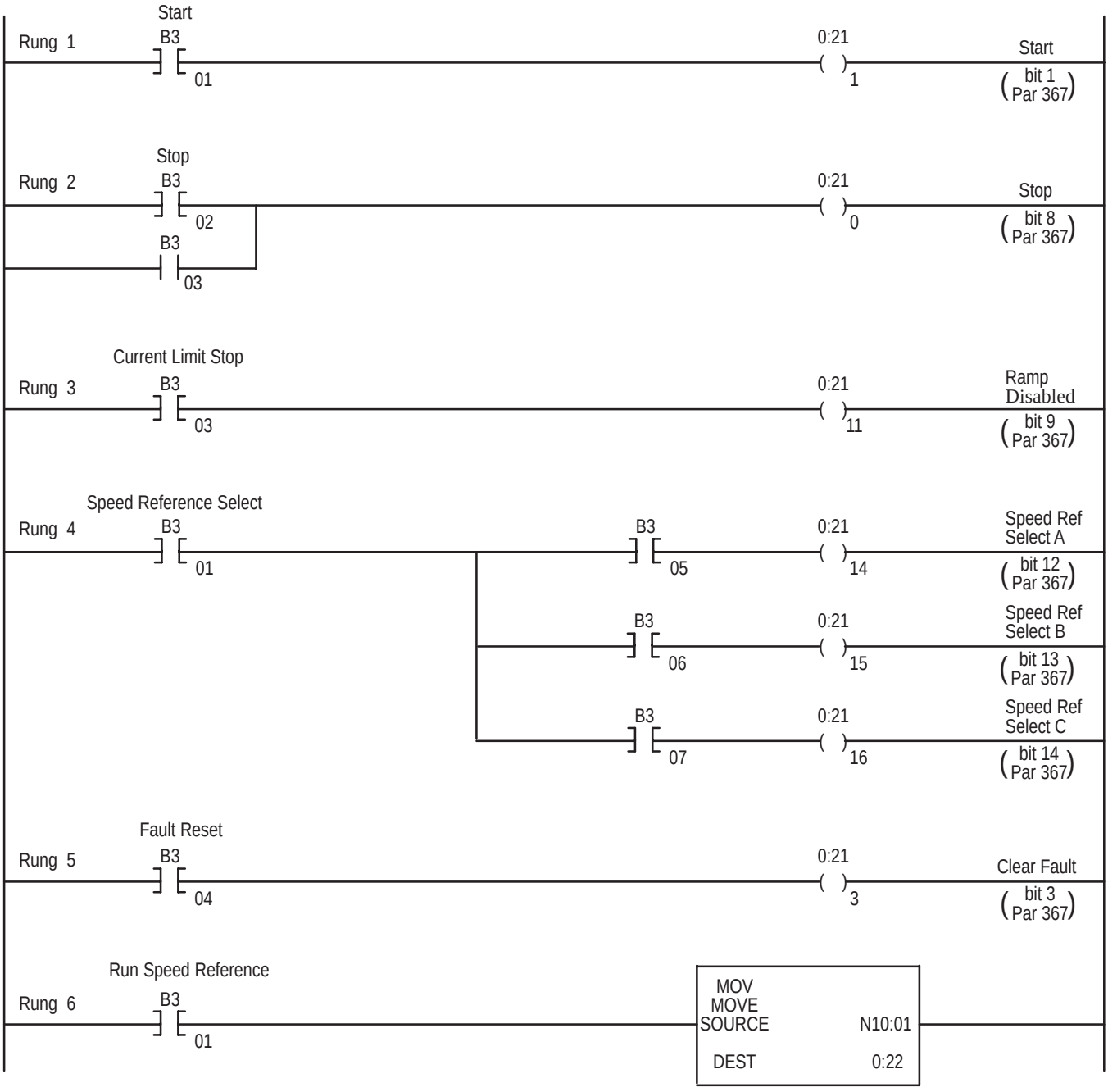
If the PLC controller is to manipulate the data transferred between the 1336 FORCE and the PLC controller in units other than drive units, the data must be appropriately scaled when it is transferred to a drive parameter. You can do the scaling either at the PLC controller or by using drive function blocks. The scaled information must be based on drive unit definitions for parameters in the 1336 FORCE.

Parameter 101, Velocity Reference 1 HI, shown in the previous figure, is in drive units, where 4096 is defined as base speed. If the PLC controller program is written in terms of feet-per-minute (fpm), then you need to convert fpm to drive units before sending it to parameter 101.

Discrete I/O Program Example

A PLC controller program is shown on the next page. You could use this example to control the 1336 FORCE. Based on the configuration shown in the previous figure, the PLC controller program transfers information to parameters 367 and 101 in the 1336 FORCE. Logic bits in File B3 of the PLC controller are used to set the drive logic control bits, and integer file N10 word 01 is used to store the drive speed reference.

To control the logic operation of the drive, the PLC program must control the bits in the output image table that correspond to the desired operation. Because parameter 331 in the previous figure has been linked to parameter 367 and parameter 331 is associated with group 1 in the output image table, the PLC controller program is controlling bits in word 0:21.



In this example, word 1 of integer file N10 stores the speed reference for the drive. The MOV block in rung 6 of the example PLC program transfers the 16 bit word N10:01 to word 2 of the output image table. Because word 2 of the output image table is sent to parameter 332, which in turn is linked to parameter 101, the 16–bit word N10:01 is the speed reference input to drive parameter 101.

Information transferred back to the PLC controller from the drive is handled much as it was in the previous example, with the exception that data is transferred into the input image table of the PLC controller. Again, note that bit coded words such as parameter 56, Logic Status LOW, are bit numbered in octal in the PLC controller, while the drive is in decimal.

Transferring Data Using Block Transfer

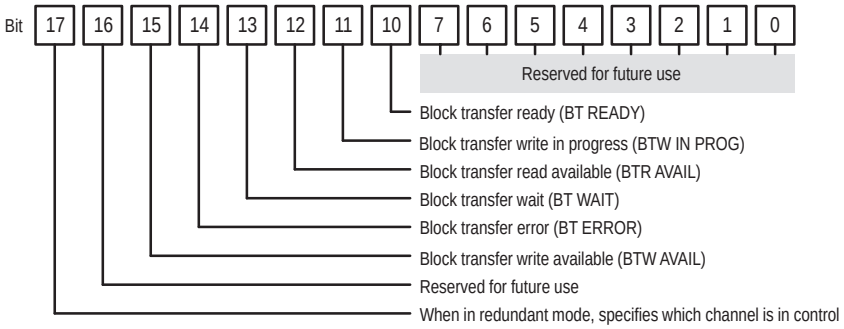
A PLC controller uses block transfer to transfer data that does not require continuous updates. To do this, the PLC Communications Adapter Board provides a status word to the PLC during the normal discrete transfer scan. This status word occupies the first module group in the PLC I/O image table for the designated rack. The PLC program then uses the status word to control the Block Transfer Write (BTW) and the Block Transfer Read (BTR) functions of the PLC controller.

The BTW transfers a request of either a read or a write of data to the drive. The BTR transfers a response of either the data being read or a status from the drive of the data write operation.

Remote I/O Module Status Word

In addition to the block transfer status word, the PLC Communications Adapter Board returns the RIO status word. The RIO status word is the first word associated with the rack in the PLC input image table. The RIO status word indicates the condition of the PLC Communications Adapter Board and is not part of the standard block transfer instructions in the PLC program.

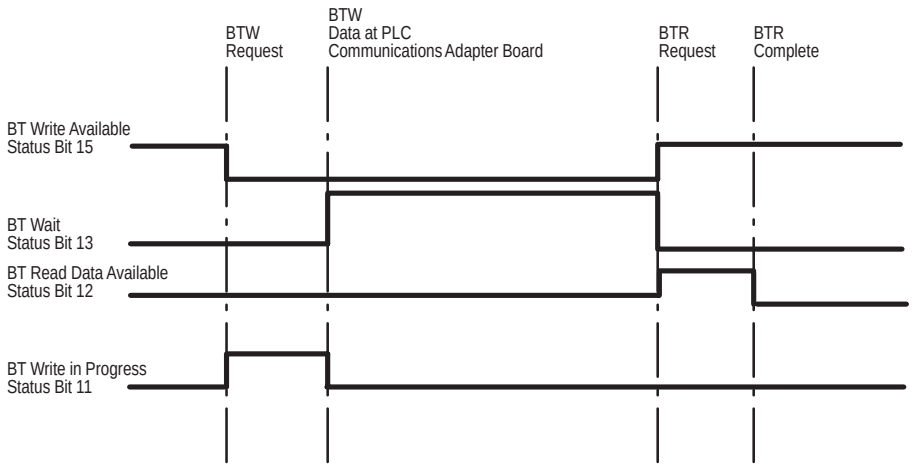
The next figure shows the information contained in this status word. Individual bits from this word are used in the PLC program to control the block transfer functions as shown in the block transfer examples in Chapter 7, *Block Transfer Services*.



If you receive this status bit:	Then:
Block Transfer Ready (Bit 10)	The SCANport device and the PLC Communications Adapter Board are communicating and are ready to process block transfers.
Block Transfer Write In Progress (Bit 11)	A block transfer write is in progress between the PLC controller and the PLC Communications Adapter Board. This bit is cleared when the data transfer to the PLC Communications Adapter Board is complete.
Block Transfer Read Data Available ① (Bit 12)	The PLC Communications Adapter Board has data available for the PLC controller to read.
Block Transfer Wait (Bit 13)	The PLC Communications Adapter Board is processing data. This bit is cleared when the data is available.
Block Transfer Error ① (Bit 14)	An error has occurred during communications with the SCANport device or the BTW data table is invalid.
Block Transfer Write Available (Bit 15)	A block transfer write is in progress between the PLC controller and the PLC Communications Adapter Board, and the data is being processed by the PLC Communications Adapter Board. This bit is set when read data is available.

① These bits are used in the PLC block transfer example program on the following pages.

The following figure shows the bit timing information for block transfer.


BTW Request
BTW Data at PLC Communications Adapter Board
BTR Request
BTR Complete
BT Write Available Status Bit 15
BT Wait Status Bit 13
BT Read Data Available Status Bit 12
BT Write in Progress Status Bit 11

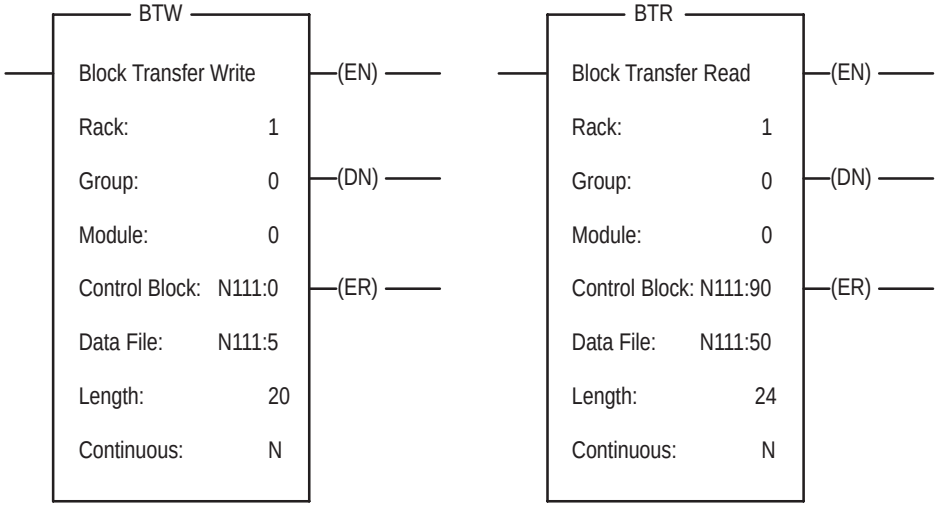
Data Storage

To use the block transfer instructions in the PLC program, you need to reserve several words for data storage. Some of these words are required for internal use by the block transfer function and some contain the block transfer message information. In the PLC-5, the BTW and BTR blocks require the use of two sets of words.

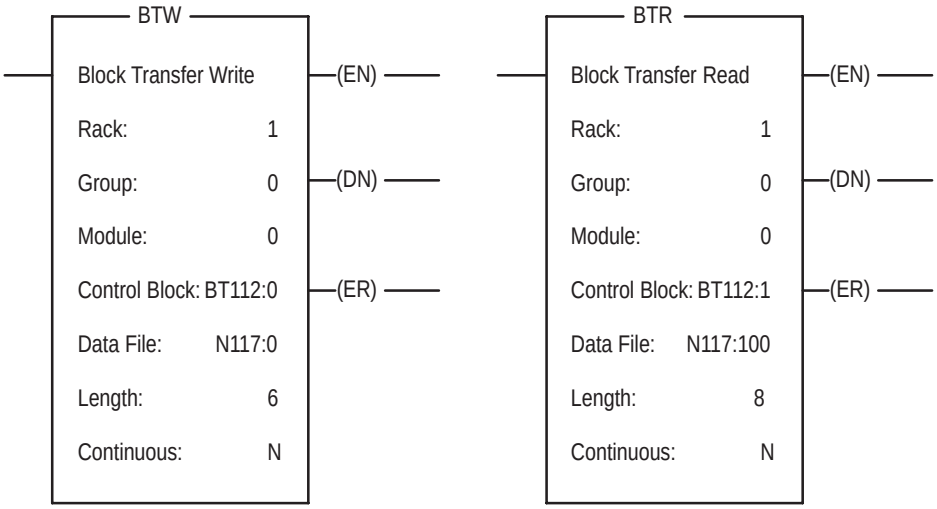
The next two figures show the BTW and BTR blocks used for block transfer in the PLC-5 along with example information associated with these blocks. A brief description of the information contained in these blocks specifically for the PLC-5 follows.

For more information on the PLC-5 and the PLC-3, refer to your PLC Control Manual.

The following figure shows the block transfer instructions used for PLC 5/15 and 5/25's.



The following figure shows the block transfer instructions used for PLC 5/40 and 5/60's.



The components of the block transfer instructions are:

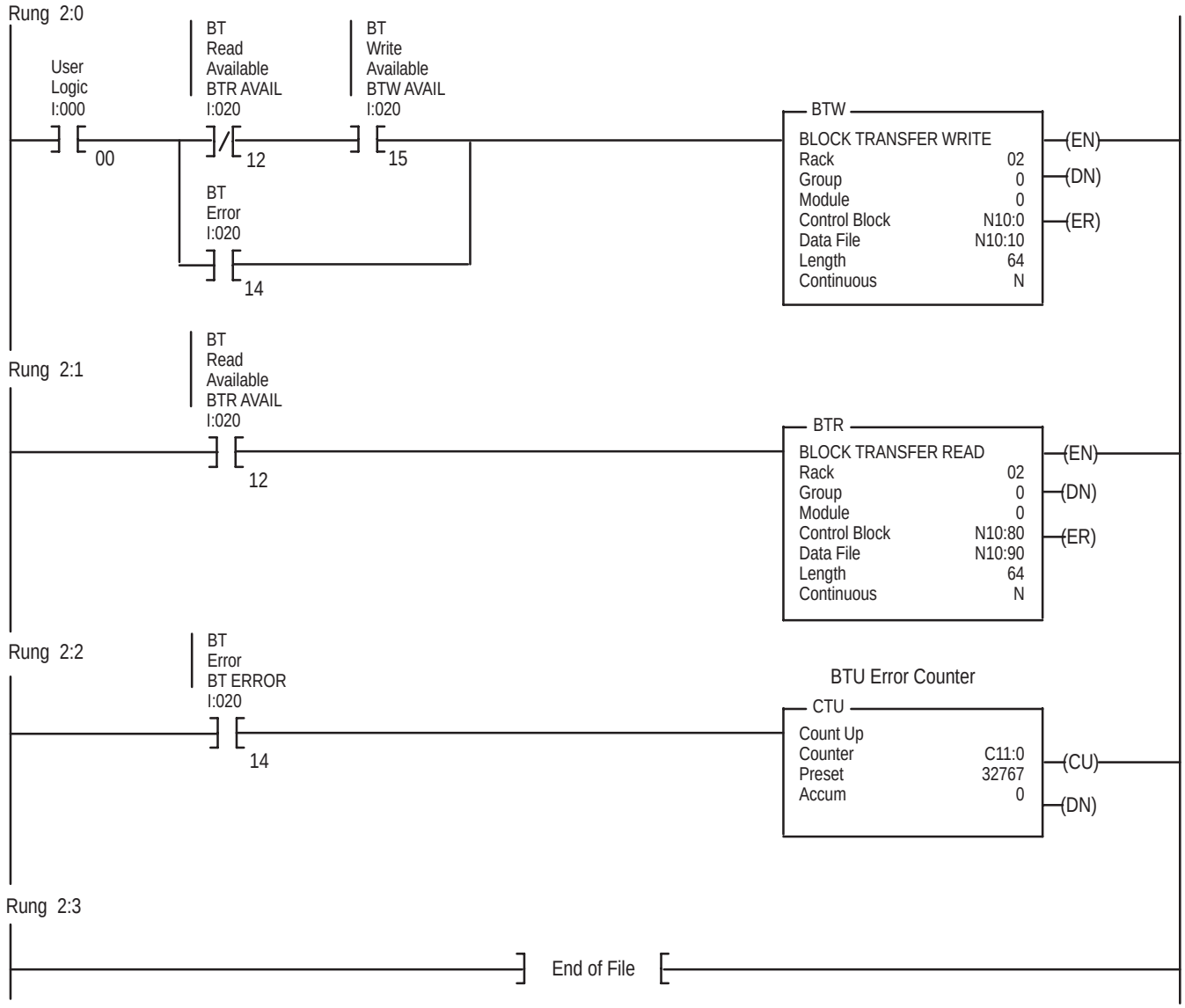
This component:	Specifies:
Rack	The rack number. The RIO switch settings on the PLC Communications Adapter Board determine the rack number.
Group	The group number of the first group in the rack associated with the PLC Communications Adapter Board. In the PLC 5/15 and 5/25 example, the rack has been set up as a full eight group rack. Therefore, the first group is 0. If you select a 1/2 rack, the first group in the rack is 0, 2, or 4. If you select a 1/4 rack, the first group in the rack is 0, 2, 4, or 6.
Module	The module number associated with the block transfer in the associated slot. This is always 0.
Control Block	The control block, which is a pre–defined set of words that contain bit information associated with the PLC block transfer functions. In the PLC–5/15 and 5/25, the control block requires five contiguous words. In the PLC–5/15 and 5/25 example, words N111:0 through N111:4 are reserved for the bit array in the BTW block and words N111:90 through N111:94 are reserved for the BTR block. In the PLC–5/40 and 5/60, the control block may be either an integer type and require five contiguous words or a block transfer type and require one element, as shown in the previous figure.
Data File	The address of the message sent by the BTW or received by the BTR block. The data file contains both header and data information. The number of words required for the data file depends on the type of message being sent. In the PLC–5/15 and 5/25 example, N111:5 is the first word in the data file for the BTW block and N111:50 is the first word for the BTR block. Refer to the message description section in Chapter 7, *Block Transfer Services*, for the header and data that must be included in the data file.
Length	The length of the block transfer message in words. This length depends on the message being sent. The BTW and BTR instruction lengths may be different. Refer to the message examples for the minimum lengths required for each message.
Continuous	Whether the block transfer block is to be executed continuously or only when the run is true. You should always set this to N.

PLC–5 Block Transfer Rung Example

The following programs are examples of block transfer programming for the PLC Communications Adapter Board. The BTW AVAIL, BTR AVAIL, and BT ERROR bits from the module status word (I:020 in these examples) are used in these examples. The examples also show how you can use user logic to enable or disable the block transfer operations.

Keep in mind that it is the header message for the BTW that defines if data is to be written to or read from the drive. Refer to Chapter 7, *Block Transfer Services*, for a complete listing of message structures.

The following program is for a PLC5/15 or 5/25.

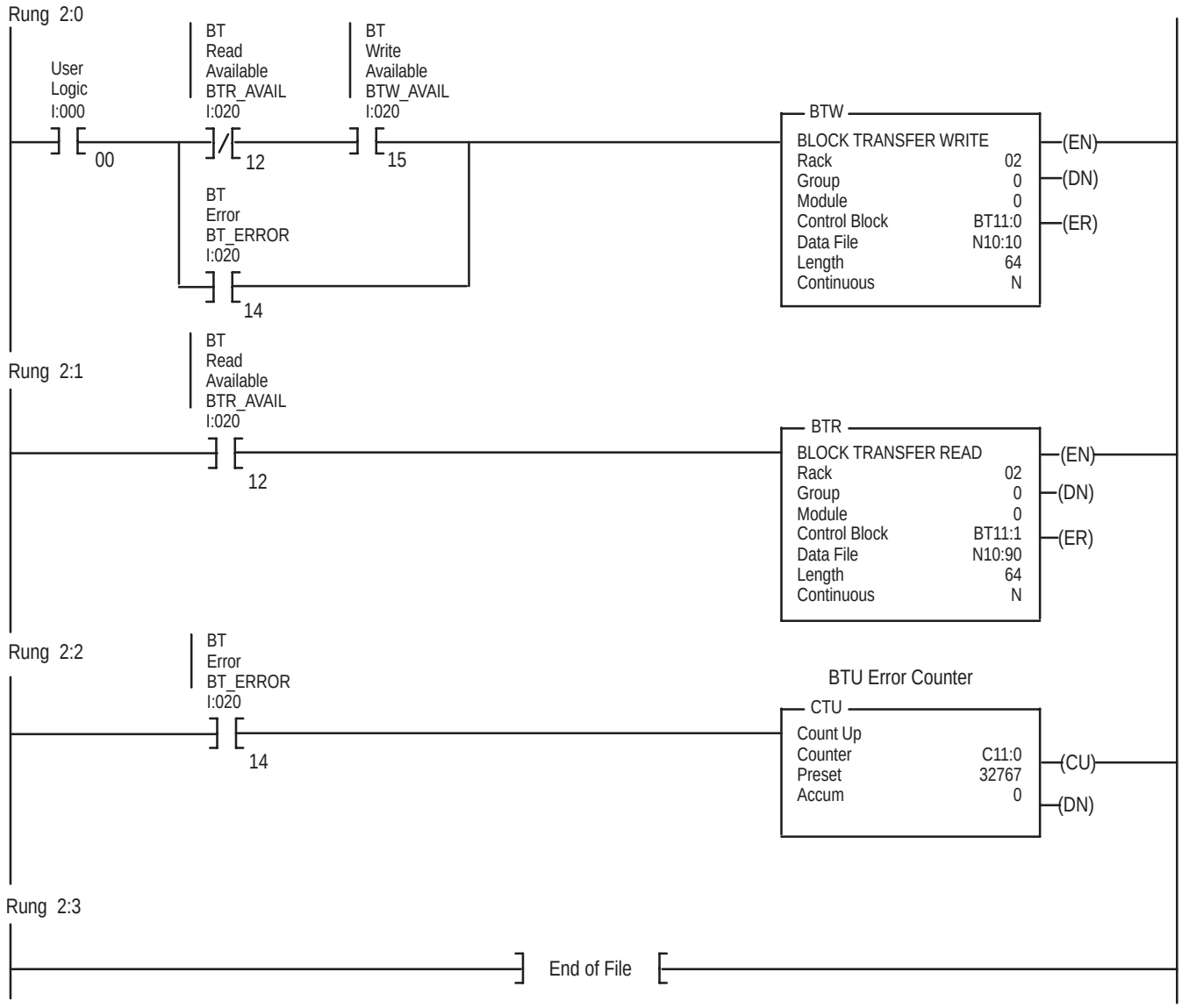


The first rung causes a Block Transfer Write (BTW) to the PLC Communications Adapter Board when the user logic bit is true. No data is available from the drive for the PLC to read when the drive is ready to accept a BTW.

The second rung causes a Block Transfer Read (BTR) from the PLC Communications Adapter Board when data is available from the drive for the PLC to read. The BTR rung is not conditioned with any user logic because a BTR should occur whenever data is available for the PLC to read from the PLC Communications Adapter Board.

The third rung causes a counter to increment each time the block transfer ERROR bit (I:020/14) goes true. You can use this bit to detect problems with the link from the PLC controller to the SCANport device.

The following program is for a PLC 5/20, 5/40, 5/60, or 5/80.



The following are additional notes regarding block transfer programming:

- You can set up a block transfer subroutine to transfer information when you need to perform multiple functions or when you need to transfer more data than a single BTW/BTR pair can handle. If you use a block transfer subroutine, you need to carefully sequence the block transfers so that one BTW and one BTR occur for each portion of the sequence.
- The status bits from the BTW and BTR control files (EN, DN, and ER) may change at any time during a program scan. If your program uses these status bits, you should copy them to a file and use the copied versions in your program.

Using RIO Redundant Mode

When you configure both channel A and channel B for RIO communications, you need to decide whether both channels will act independently or if one channel will act as a back up for the other channel, which is referred to as RIO redundant mode. If you want both channels to act independently, set both channels to RIO communications, but do not set the DIP switch settings for the redundant mode.

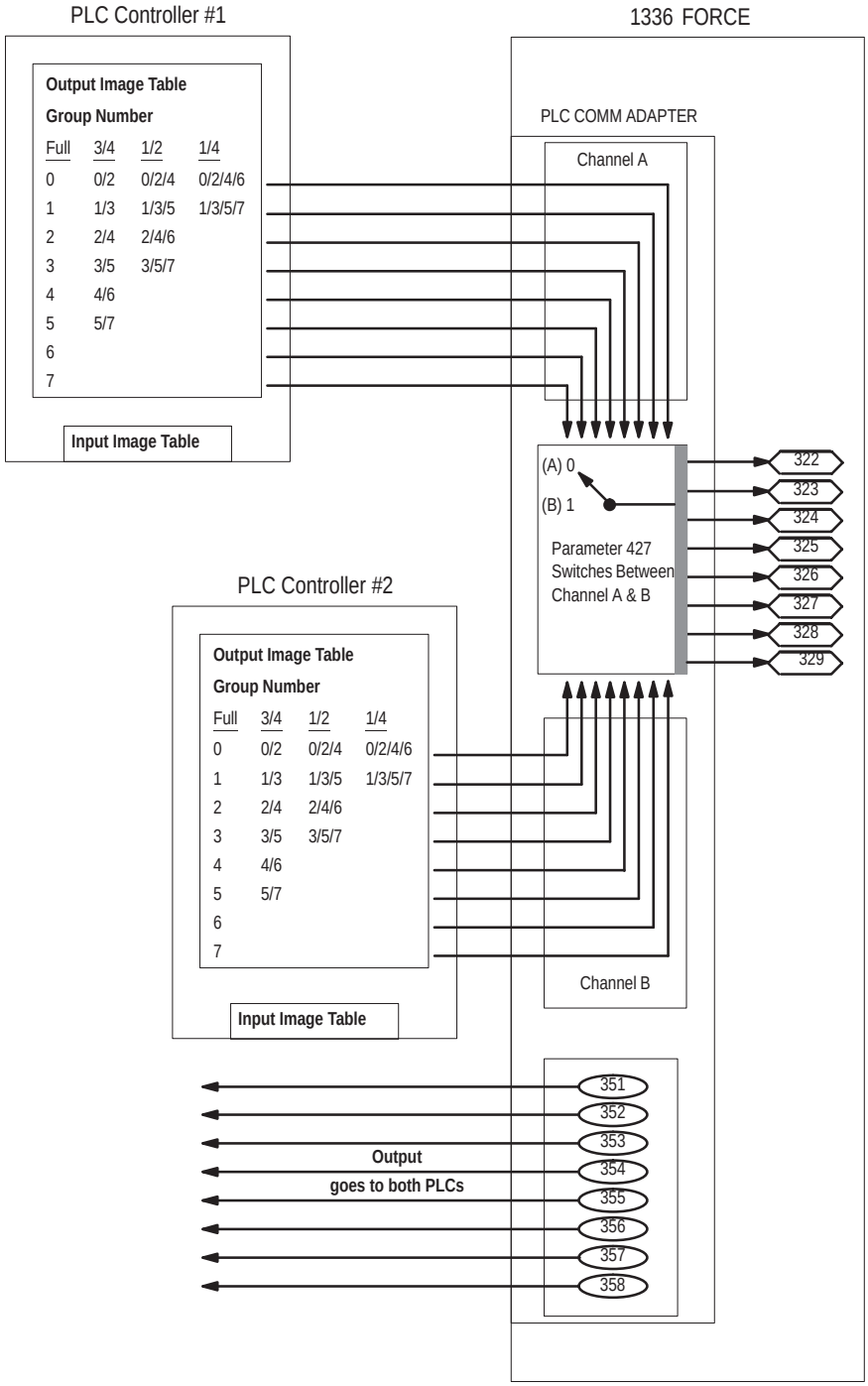
By using RIO redundant mode, you can connect the drive to the RIO channel of two separate PLC controllers. Parameter 427 specifies which PLC controller (channel A or B) has control of the drive. Output image table data from the non-controlling PLC is discarded. However, if the protocols for both channels is set to RIO adapter with block transfer, then block transfer requests are accepted from both channels.

To use the RIO redundant mode, you need to:

- Configure both channel A and channel B for the RIO protocol.
- Set the DIP switch for channel A for the redundant mode.
- Configure both channel A and channel B for the same size. For example, both channels must be configured for a full, 3/4, 1/2, or 1/4 rack.

Output data from the drive is sent to both PLCs.

The following shows a typical redundant mode configuration.



The redundant mode operates as follows:

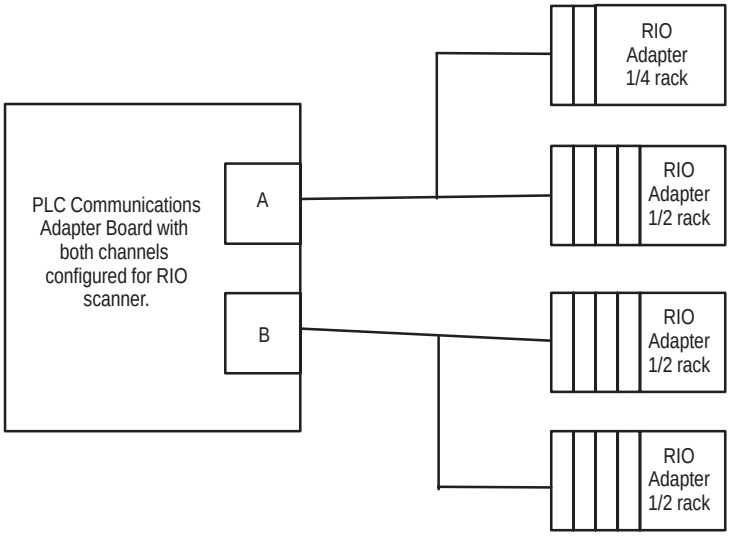
1. The respective PLC controller transfers data from the output image table of each PLC controller to the PLC Communications Adapter Board.
2. The RIO redundant channel number parameter (parameter 427) determines which PLC controller's output is made available to the drive via parameters 322 through 329.
3. Each PLC controller input image table receives data from the drive via parameters 351 through 358.
4. Block transfer messages from both drives are processed as normal if both channels are configured for block transfer.

Using RIO Scanner Mode

The RIO scanner mode allows you to control a logical rack of I/O data from a single drive. The I/O data that makes up the logical rack may be located on multiple devices, but the drive using RIO scanner mode sees the logical rack of I/O data as a single unit. The drive keeps track of the devices by using a scan list, which is a list of the devices to scan.

The RIO scanner scans only one logical rack of data, which is eight words of I/O data. The logical rack that is scanned can either be a full rack or any combination of partial racks (such as 1/4 rack, 1/2 rack, or 3/4 rack) as long as the total does not exceed one logical rack. For example, you could have the RIO scanner scan a 1/4 rack and a 3/4 rack, but you could not have the RIO scanner scan a 1/2 rack with a 3/4 rack. You could also have the RIO scanner scan less than a full rack, such as scanning two 1/4 racks.

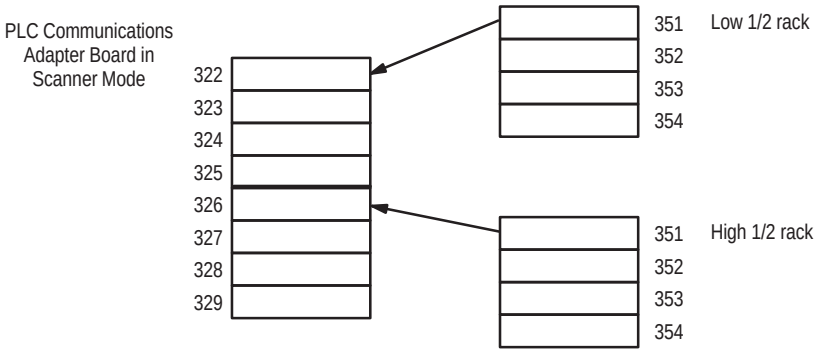
You can set either channel A, channel B, or both channels for RIO scanner mode. However, if you set both channels for RIO scanner, you need to make sure that they are on separate blue hose cables as shown here.


PLC Communications Adapter Board with both channels configured for RIO scanner.
A
B
RIO Adapter 1/4 rack
RIO Adapter 1/2 rack
RIO Adapter 1/2 rack
RIO Adapter 1/2 rack

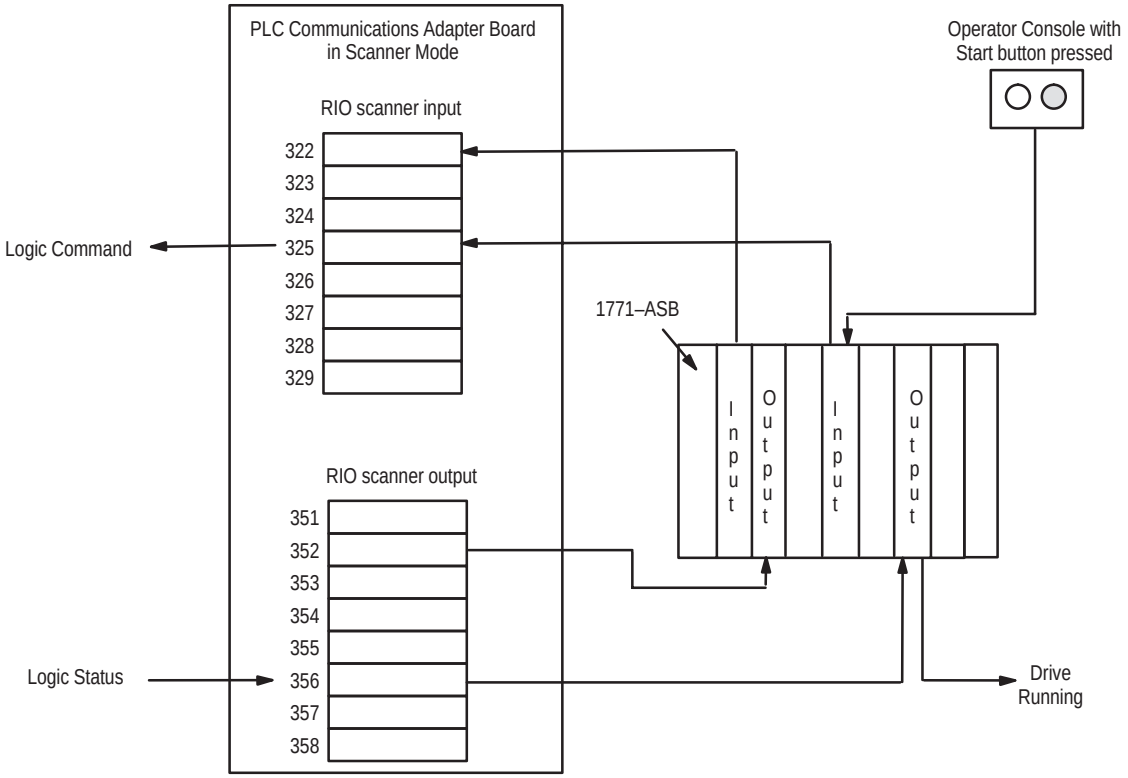
Important: Block transfer is not supported on channels configured for RIO scanner.

When you are using a device such as a Bulletin 1201 Graphics Programming Terminal (GPT), if you look at the data from the PLC Communications Adapter Board, you should be aware that the information for each rack within a channel is placed in word 0.

For example, if you have two 1/2 racks being scanned on one channel, the low 1/2 rack will place data in parameters 351 through 354, and the high 1/2 rack can also place data in parameters 351 through 354. However, from the PLC scanner side, this information could be viewed in parameters 322 through 329.



The following is an example of a PLC Communications Adapter Board that is scanning an I/O rack that is set up for 1–slot addressing. When the Start button on the operator console is pressed, a signal is sent to the attached input card on the I/O rack, which is connected to a PLC Communications Adapter Board that is set up in scanner mode.



To use the RIO scanner mode, you need to do the following:

- Set the rack address of the RIO adapter channel(s) to 1.
- Choose which channel(s) you want to use RIO scanner on.
- Set the DIP switches appropriately. DIP switch settings are covered in Chapter 2, *Starting Up*.
- Make sure that you are only trying to scan one logical rack of data.

Important: Block transfer is not supported in RIO scanner mode.

Using DH+ Communications

Chapter Objectives

Chapter 4 provides the following information:

- DH+ features
- block transfer message structures
- DH+ command set

DH+ Features

You can configure either one or both channels for DH+ communications. Configuration as a DH+ device allows the drive to look like a station on the DH+ link. DH+ features include:

- 57.6K, 115K, and 230K baud communication rates
- Parameter read and write messages for a block of parameters
- A method similar to RIO block transfer that allows the PLC controller to issue drive messages via DH+

Message Instruction

The message instruction is used to read and write a block of data to another station on the DH+ link. The following is a description of the message instruction field data. Refer to the example program at the end of this chapter for a message instruction example.

This function:	Specifies:
Communication Command	Whether the MSG instruction performs a PLC5 TYPED READ to read data from the drive or a PLC 5 TYPED WRITE to write data to the drive.
PLC5 Data Table Address	The data file address where data is stored. • If the MSG operation is a write, this address is the starting word of the source file for data sent to the PLC Communications Adapter Board. • If the MSG operation is a read, this address is the starting word of the destination file for data returned from the PLC Communications Adapter Board.
Size In Elements	The number of elements to be transferred. Note that: • For a Read Parameter function, each element is one word. Therefore, when reading 10 parameter values, the field needs to be a length of 10 elements. • For a Read Parameter Full, each element is 20 words long. Therefore, a Read Full function of 6 parameters requires an entry of 120 elements. • For N40, the size must be 64 words.
Local/Remote	Local indicates the message is sent to a device on the local DH+ link. For this application, this field is always local.
Local Node Address	The local station address on the DH+ link. This is defined through the DIP switches (U3 or U5) on the PLC Communications Adapter Board.
Destination Data Table Address	The starting address represents the type of service requested at the PLC Communications Adapter Board destination file. Refer to the DH+ Command Set section for more information.

DH+ Command Set

The PLC Communications Adapter Board supports a limited set of PC commands by emulating a section of PLC-5 memory. The memory area emulated determines what specific request or action the PLC Communications Adapter Board will take.

The following commands are supported:

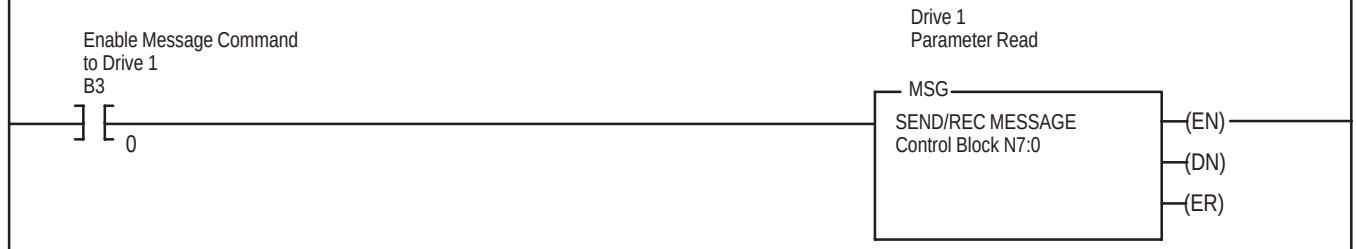
Command:	Description:
WHO ACTIVE	The station number of the PLC Communications Adapter Board as defined by its DIP switch settings is displayed on the WHO ACTIVE screen of the PLC software. It will read PLC–5/15 1336T next to the selected station number.
PLC 5 TYPED READ (N10:1–493)	Memory area N10:1–493 translates into a read parameter value from the 1336 FORCE. Any attempt to read outside of this range results in an error response. The 1336 FORCE interprets the values 1 through 493 as parameter numbers. For example, to read the value of parameter 133, the MSG instruction would request N10:133 with a size of one element. A size of 10 would read parameters 133 through 142.
PLC 5 TYPED WRITE (N10:1–493)	Memory area N10:1–493 translates into one or more write parameter values to the 1336 FORCE. If you try to write outside of this range, you will get an error. The 1336 FORCE interprets the values 1 through 493 as parameter numbers. For example, to write a value to parameter 119 (Preset Speed 1), the MSG instruction would specify N10:119 with a size of one element. A size of 10 will write to parameters 119 through 128.
PLC TYPED READ (N20:0–493)	This request reads the status of the previous parameter writes (N10:1–493). If a TYPED READ is specified with a PLC address of N20:0, the write status of all parameters from the last TYPED WRITE request (N10:X–XXX) are OR'ed together. If one error has occurred during the last write operation, this address contains the parameter number where the error occurred. If multiple errors occurred, the value is –1, and the PLC controller can request a TYPED READ of N20:1–493 to determine which parameters have had errors.

Command:	Description:
PLC TYPED READ (N30:0–493)	This request translates into a read parameter full message in the 1336 FORCE. Each parameter specified results in 20 words of data (actual value, minimum value, maximum value, descriptor, and parameter text). You can read a maximum of 50 parameters with this service if your PLC uses a file size of 1000 words. If your PLC uses a different file size, this service may take a different number of parameters.
PLC 5 TYPED READ (N40:0–63)	This message emulates the RIO block transfer functions available on the PLC Communications Adapter Board with the exception of the multiple parameter read. Refer to the message structure section in Chapter 7, *Block Transfer Services*, for details on the available messages and their use.
PLC 5 TYPED WRITE (N40:0–63)	This message emulates the RIO block transfer functions available on the PLC Communications Adapter Board. Refer to the message structure section in Chapter 7, *Block Transfer Services*, for details on the available messages and their use.
PLC 5 TYPED READ (N70:0–499) for Trend 1 (N71:0–499) for Trend 2 (N72:0–499) for Trend 3 (N73:0–499) for Trend 4	This message reads the trend sampled data, which is the data retained when a trigger condition occurs. A file of 70 corresponds to trend 1, 71 to trend 2, 72 to trend 3, and 73 to trend 4.

The remainder of this chapter shows three rungs from a sample program for a PLC 5/15.

Rung 2:0

This rung will read parameters 100-109 when bit B3/0 is toggled from zero to one. The parameter information is stored in N20: 0-9 in this PLC. The drive DH+ station ID is 11.



MESSAGE INSTRUCTION DATA MONITOR FOR CONTROL BLOCK N7:0

Communication Command:	PLC-5 TYPED READ		
PLC-5 Data Table Address:	N20:0	Ignore if timed-out:	0 TO
Size in Elements:	10	to be retried:	0 NR
Local/Remote:	LOCAL	awaiting execution:	0 EW
Remote Station:	N/A	continuous:	0 CO
Link ID:	N/A	error:	0 ER
Remote Link Type:	N/A	message done:	0 DN
Local Node Address:	11	message transmitting:	0 ST
Destination Data Table Address:	N10:100	message enabled:	0 EN
		control bit addr:	N7:0/15

ERROR CODE: 0 (DEC)

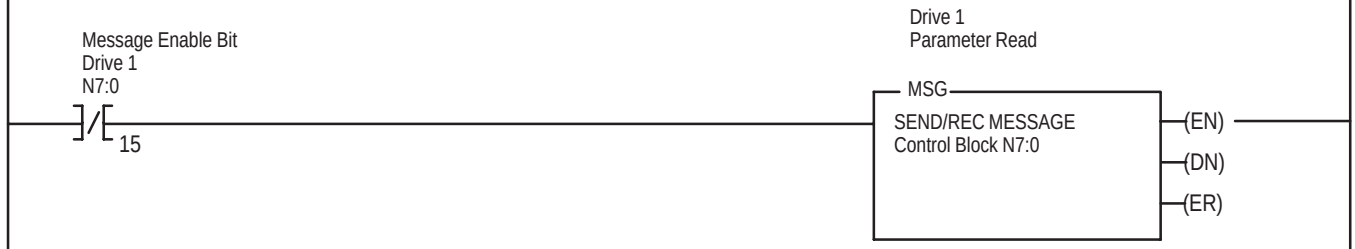
BLOCK SIZE = 9 WORDS

Press a function key to change a value.

>[

Rem Prog Forces:	None	Data: Formatted	5/10 File Temp
	Size in Elements		Toggle Bit

Rung 2:0
This rung will read parameters 100-109 on a continuous basis by using the Message Block enable bit to toggle the next message. The parameter information is stored in N20: 0-9 in the PLC. The drive DH+ station ID is 11.



MESSAGE INSTRUCTION DATA MONITOR FOR CONTROL BLOCK N7:0

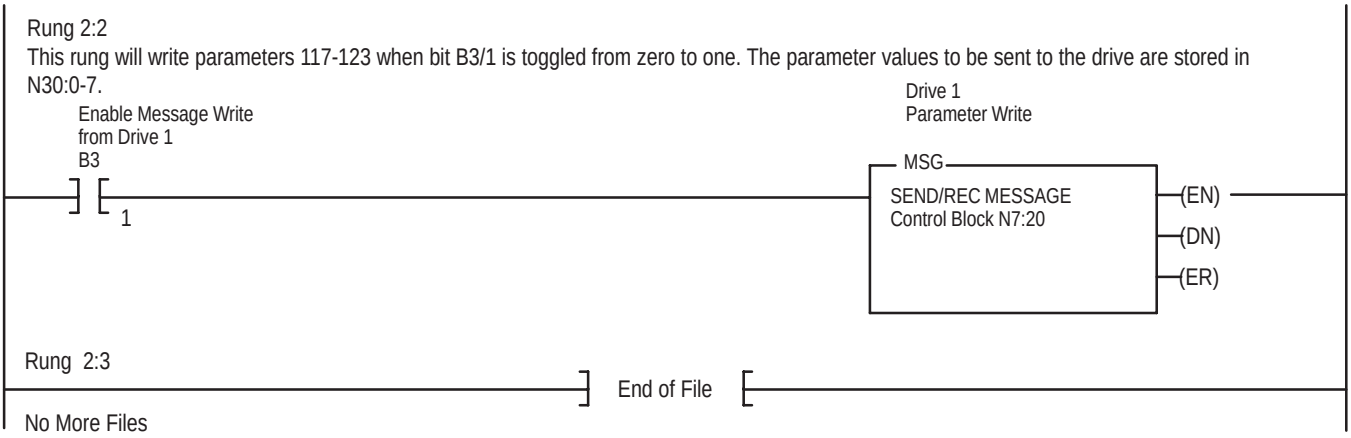
Communication Command:	PLC-5 TYPED READ		
PLC-5 Data Table Address:	N20:0	Ignore if timed-out:	0 TO
Size in Elements:	10	to be retried:	0 NR
Local/Remote:	LOCAL	awaiting execution:	0 EW
Remote Station:	N/A	continuous:	0 CO
Link ID:	N/A	error:	0 ER
Remote Link Type:	N/A	message done:	0 DN
Local Node Address:	11	message transmitting:	0 ST
Destination Data Table Address:	N10:100	message enabled:	0 EN
		control bit addr: N7:0/15	

ERROR CODE: 0 (DEC)

BLOCK SIZE = 9 WORDS

Press a function key to change a value.
>[

Rem Prog Forces: None	Data: Formatted		5/10 File Temp
Size in Elements			Toggle Bit


Rung 2:2
This rung will write parameters 117-123 when bit B3/1 is toggled from zero to one. The parameter values to be sent to the drive are stored in N30:0-7.
Enable Message Write from Drive 1 B3
1
Drive 1 Parameter Write
MSG
SEND/REC MESSAGE
Control Block N7:20
(EN)
(DN)
(ER)
Rung 2:3
End of File
No More Files

MESSAGE INSTRUCTION DATA MONITOR FOR CONTROL BLOCK N7:0

Communication Command:	PLC-5 TYPED WRITE		
PLC-5 Data Table Address:	N30:0	Ignore if timed-out:	0 TO
Size in Elements:	7	to be retried:	0 NR
Local/Remote:	LOCAL	awaiting execution:	0 EW
Remote Station:	N/A	continuous:	0 CO
Link ID:	N/A	error:	0 ER
Remote Link Type:	N/A	message done:	0 DN
Local Node Address:	11	message transmitting:	0 ST
Destination Data Table Address:	N10:117	message enabled:	0 EN
		control bit addr: N7:20/15	

ERROR CODE: 0 (DEC)

BLOCK SIZE = 10 WORDS

Press a function key to change a value.

>[

Rem Prog Forces: None	Data: Formatted		5/10 File Temp
Size in Elements			Toggle Bit

Understanding the Resources of Your Drive

Chapter Objectives

Chapter 5 provides information about using the resources that are available with your drive. The following topics are covered in this chapter:

- understanding the SCANport logic control and operation
- understanding function blocks
- using system resources

Using the SCANport Capabilities

You can make some changes to the default configuration to customize the way SCANport works for you. This section covers the following topics:

- understanding the logic command parameter
- configuring the SCANport controls
- setting the loss of communications fault
- viewing the SCANport faults and warnings
- using the SCANport image
- setting the analog I/O parameters

Understanding the Logic Command Parameter

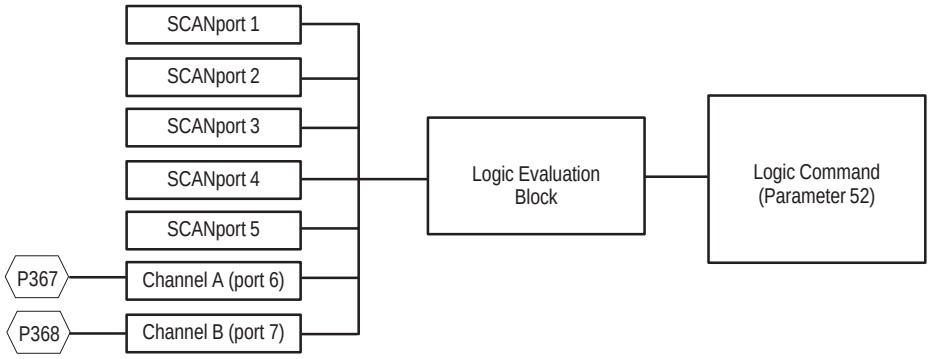
The Logic Command parameter (parameter 52) on the 1336 FORCE is modified by receiving input from ChA Logic Cmd In, ChB Logic Cmd In, and SCANport devices 1 through 5 on the PLC Communications Adapter Board. To use these parameters effectively, you need to understand how the Logic Command parameter works.

The Logic Command provides information about what functions are currently executing. You can access the individual bits of the Logic Command to find information about these functions:

This bit:	Identifies this function:		This bit:	Identifies this function:
0	Ramp Stop		8	Coast Stop
1	Start		9	Ramp Disable
2	Jog1		10	Flux Enable
3	Clear Fault		11	Process Trim Enable
4	Forward		12	Velocity Ref Select A
5	Reverse		13	Velocity Ref Select B
6	Jog2		14	Velocity Ref Select C
7	Current Limit Stop		15	Reset Drive

You cannot change the values shown in the Logic Command by directly accessing the parameter. Instead, the Logic Command receives information from the logic evaluation block.

The logic evaluation block can receive information from up to seven sources. The logic evaluation block takes this information and combines it to form a single logic command word:



In this figure, notice that there are five SCANports and two channels that can provide information to the logic evaluation block. You can attach any combination of Human Interface Modules (HIMs), Graphic Programming Terminals (GPTs), and/or SCANport communications modules to any of the five SCANports.

Note: SCANports 1 and 2 are always available directly from the PLC Communications Adapter Board. To access SCANports 3, 4, and 5, you need to attach a SCANport Expansion Board to your PLC Communications Adapter Board.

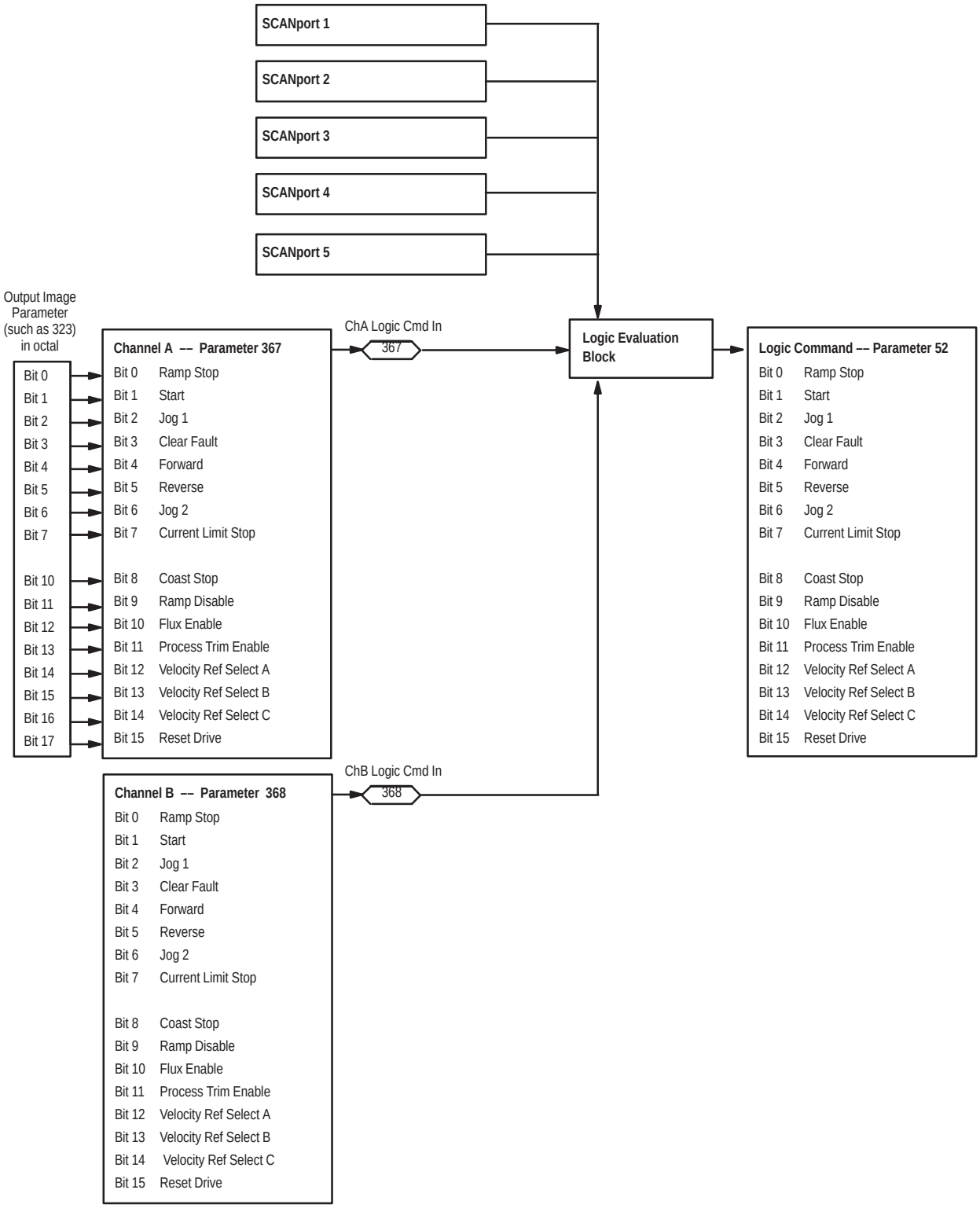
The two available channels are accessed through parameters 367 (ChA Logic Cmd In) and 368 (ChB Logic Cmd In). Both parameters have the same bit definitions as the Logic Command. Therefore, even if you do not set up a channel for RIO communications, you can still write to parameters 367 and 368 by using block transfer or by possibly linking to a function block.

Important: In the PLC controller, internal bit numbering is 0 through 15 decimal and I/O bit numbering is 0 through 17 octal. However, bit numbering in the drive parameters, including ChA Logic Cmd In and ChB Logic Cmd In, is 0 through 15 decimal. You should keep this in mind when working with the Logic Command.

For example, if you want to set the Ramp Disable bit in the Logic Command (bit 9 decimal), you would need to set bit 11 (octal) in your PLC program.

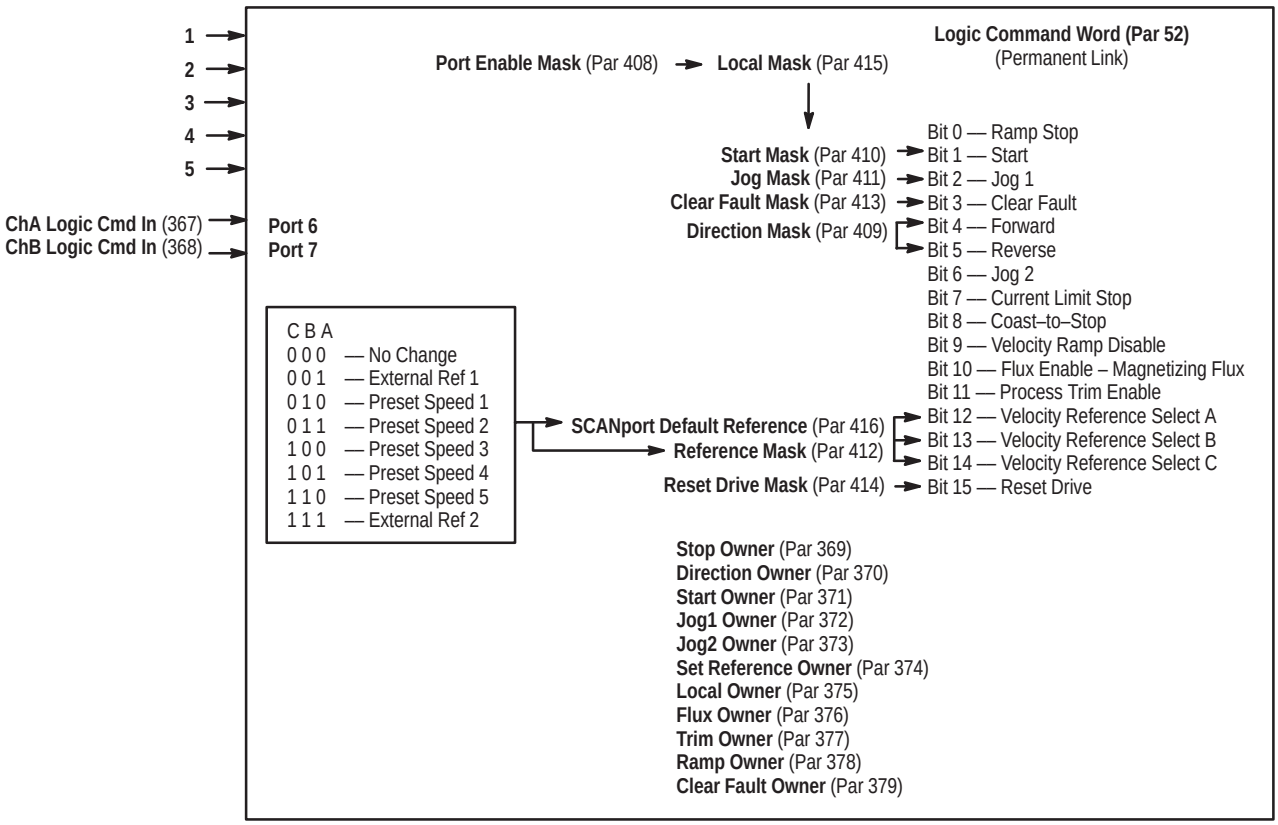
If you select the external speed reference, the PLC controller must send a 16–bit word to parameter 101, Velocity Reference 1 HI, in the drive. Because the speed reference is a complete 16–bit word, the PLC controller must send the data as a complete word rather than as individual bits as was the case for logic command bits.

The following figure shows the correlation between the output image table bits and the bits used by the Logic Command.



This next figure shows the parameter interactions involved with the Logic Command.

SCANport Logic Command Configuration Masks


1
2
3
4
5
ChA Logic Cmd In (367)
ChB Logic Cmd In (368)
Port 6
Port 7
Port Enable Mask (Par 408)
Local Mask (Par 415)
Logic Command Word (Par 52)
(Permanent Link)
Start Mask (Par 410)
Jog Mask (Par 411)
Clear Fault Mask (Par 413)
Direction Mask (Par 409)
Bit 0 — Ramp Stop
Bit 1 — Start
Bit 2 — Jog 1
Bit 3 — Clear Fault
Bit 4 — Forward
Bit 5 — Reverse
Bit 6 — Jog 2
Bit 7 — Current Limit Stop
Bit 8 — Coast–to–Stop
Bit 9 — Velocity Ramp Disable
Bit 10 — Flux Enable – Magnetizing Flux
Bit 11 — Process Trim Enable
Bit 12 — Velocity Reference Select A
Bit 13 — Velocity Reference Select B
Bit 14 — Velocity Reference Select C
Bit 15 — Reset Drive
C B A
0 0 0 — No Change
0 0 1 — External Ref 1
0 1 0 — Preset Speed 1
0 1 1 — Preset Speed 2
1 0 0 — Preset Speed 3
1 0 1 — Preset Speed 4
1 1 0 — Preset Speed 5
1 1 1 — External Ref 2
SCANport Default Reference (Par 416)
Reference Mask (Par 412)
Reset Drive Mask (Par 414)
Stop Owner (Par 369)
Direction Owner (Par 370)
Start Owner (Par 371)
Jog1 Owner (Par 372)
Jog2 Owner (Par 373)
Set Reference Owner (Par 374)
Local Owner (Par 375)
Flux Owner (Par 376)
Trim Owner (Par 377)
Ramp Owner (Par 378)
Clear Fault Owner (Par 379)

The owner parameters (369 through 379) are covered in the next section.

Configuring the SCANport Controls

The SCANport controls are the functions that control the motor, such as start, stop, and jog. The control can come from up to five SCANport devices and two RIO inputs (parameters 367 and 368) at the same time. The control is based on an ownership mechanism that allows certain functions to only have one owner and other functions to have multiple owners. Speed reference, direction, and local functions are the only one owner functions. The other functions, such as start, stop, and jog, are considered multiple owner functions.

Note: When you apply power to the system, the default input speed reference is specified in SP Default Ref (parameter 416). You can change the value of SP Default Ref at any time, but the change does not take effect until the power is cycled. SP Default Ref may be set to external reference 1 or 2 or preset speeds 1, 2, 3, 4, or 5.

Ownership is when a SCANport device commands a function. As long as that function is commanded, that device is the owner of that function. For example, if device 1 is commanding a forward direction, which is a one owner function, no other device can change the direction until device 1 stops commanding the forward direction. If device 1 is commanding a start, which is a multiple owner function, other devices can also command a start. If device 1 stops commanding the start, the drive does not stop running if another device is still commanding the start.

Note: A rising edge is required for start and jog functions. If a jog or start is still commanded after the drive is stopped, start and jog functions will not operate from any device until the jog or start commands are removed.

Determining Function Ownership

To determine which device is issuing a specific command, you can use parameters 369 through 379:

To determine which device is issuing this command:	Check this parameter:
Stop	369
Direction control	370
Start	371
Jog1	372
Jog2	373
Velocity reference	374
Local control	375
Flux enable	376
Trim enable	377
Ramp	378
Clear fault	379

For each of these parameters, each bit represents a device:

If this bit is set:	Then, the owner is:
1	SCANport device 1
2	SCANport device 2
3	SCANport device 3
4	SCANport device 4
5	SCANport device 5
6	ChA Logic Cmd In
7	ChB Logic Cmd In

NOTE: Bit 0 is not used. Also, the SCANport device number is determined by the SCANport connection it is plugged into.

Masking Control Functions

You can also mask control functions. This allows you to enable or disable a control function for all or some of the devices.

Important: You cannot mask the stop command. Any device attached to the PLC Communications Adapter Board can stop the drive at any time.

To set a mask for a control function, you can use the following parameters:

To set a mask to control this function:	Use this parameter:
Control which ports can accept the control functions	408
Issue forward/reverse commands	409
Issue a start command	410
Issue a jog command	411
Select an alternate reference or preset speed	412
Generate a clear fault command	413
Reset faults	414
Allow exclusive control of logic commands	415

For each of these parameters, each bit represents a device:

This bit:	Represents:
1	SCANport device 1
2	SCANport device 2
3	SCANport device 3
4	SCANport device 4
5	SCANport device 5
6	ChA Logic Cmd In
7	ChB Logic Cmd In

NOTE: Bit 0 is not used. Also, the SCANport device number is determined by the SCANport connection it is plugged into.

If a bit is set to 0 for a mask parameter, the control function is disabled. If a bit is set to 1, the control function is enabled.

There are three levels of masking control functions:

The Port Enable mask can enable or disable all of the device's control functions. If the Port Enable mask is set to enable the control functions, the control is passed to the Local Mask. The Local Mask can allow a device to take full control of a drive. If the device does not have full control, then the individual masks can take effect.

Setting the Loss of Communications Fault

You can specify how you want to be notified if SCANport loses the connection to a port.

If you want a communications loss to be:	Then:
Reported as a fault	Set the appropriate bit in parameter 440 corresponding to the SCANport.
Reported as a warning	Set the appropriate bit in parameter 441 and do not set (clear) the bit in parameter 440.
Ignored	Do not set (clear) the appropriate bit in either parameter 440 or 441.

The following table shows you which bits correspond to which ports:

This bit:	Represents:
1	SCANport device 1
2	SCANport device 2
3	SCANport device 3
4	SCANport device 4
5	SCANport device 5

For example, if you want a fault condition to be reported if communication is lost with device 3, you would set bit 3 of parameter 440.

ATTENTION: If you initiate a command to start motor rotation (command a start or jog) and then disconnect the programming device, the drive will not fault if you have the SCANport communications fault set to be ignored for that port.

Viewing the SCANport Fault Status

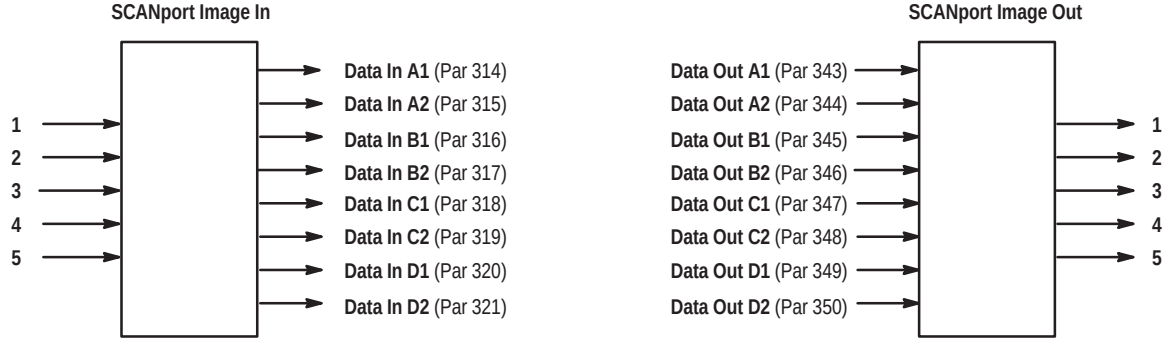
If a fault occurs while using SCANport, you can use parameters 442 and 443 to determine the port at which the fault was encountered. Use parameter 442, SP Fault Sts, to view the fault status and parameter 443, SP Warn Sts, to view the warning status. For either parameter, you can use the following table to determine where the problem was encountered:

This bit:	Represents:
1	SCANport device 1
2	SCANport device 2
3	SCANport device 3
4	SCANport device 4
5	SCANport device 5

Using the SCANport Image

The SCANport image is a mechanism for transferring data between SCANport devices and the drive. The SCANport image is used in transferring real–time data in the same way as the PLC image is used. The devices on SCANport allocate the SCANport image so multiple devices can use different parts of the image. The image can be divided into a full, 3/4, 1/2, or 1/4 rack. This allows a maximum of four devices to access the drive at the same time.

You can view the values in the SCANport image table by using parameters 314 through 321 for input and 343 through 350 for output:



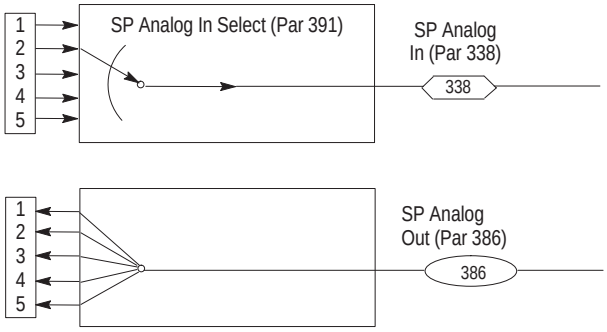
The RIO to SCANport, RS232/485 to SCANport, and DeviceNet to SCANport gateways are some of the devices that use the image.

Refer to the appropriate manual for your gateway (Bulletin 1203 Remote I/O Communications Module, Bulletin 1203 Serial Communications Module, or the DeviceNet Communications Module manual).

Setting Up the Analog I/O Parameters

The PLC Communications Adapter Board can transfer analog information over SCANport.

The following figure shows the five SCANports that are available for use with the SCANport analog I/O and the PLC Communications Adapter Board parameters that you can use to control this data.



To receive analog input from a SCANport device, you need to:

1. Set the SCANport Analog Input Select parameter (parameter 391) to the SCANport device number.
2. Link a sink parameter to the SCANport Analog Input parameter (parameter 338).

For example, if you plug a HIM into port 1 to control the external velocity, you need to enter a value of 1 for SCANport Analog Input Select (parameter 391) and link External Velocity (parameter 101) to SCANport Analog Input (parameter 338). You may scale the velocity by using External Velocity Scale (parameter 102).

The drive sends SCANport Analog Output (parameter 386) to all devices connected to SCANport. To send data out to the SCANport devices, you must link SCANport Analog Output to a source parameter. For example, if the HIM is to receive Velocity Feedback, you would link SCANport Analog Output (parameter 386) to Velocity Feedback (parameter 269).

Understanding Function Blocks

At times, you may want to customize the way your drive operates. To help you with this task, function blocks have been included with the PLC Communications Adapter Board. You can combine function blocks together to operate on almost any part of the drive functionality. The flexibility of the function block system allows blocks to be used with the drive's velocity or current control parameters, drive–to–drive parameters, as well as analog and remote I/O image parameters.

Important: This section is intended to be an overview of the function block system. For more in–depth information, refer to the Function Block Programming Manual.

The function block software provides the following advantages:

- On smaller stand-alone applications, control programming can be carried out completely within the drive.
- On larger system applications, the loading of the PLC control system can be reduced as control functions previously performed within a PLC can be performed within the drive.

At the base of the function block system are the function blocks themselves. A function block is a firmware subroutine that is stored in memory within the PLC Communications Adapter Board. The PLC Communications Adapter Board provides 28 different function block types.

These function blocks are as follows:

This function type:	Is:
ABS	An absolute value function block whose output is the positive value.
BIN2DEC	A binary to decimal function block that takes sixteen input words and produces one decimal output word.
COMPHYST	A compare with hysteresis function block that checks for input equals preset value with a hysteresis around the value.
DEC2BIN	A decimal to binary function block that takes one decimal input word and produces sixteen binary output words.
DELAY	A time delay function block that echoes a logic input after a delay.
DERIV	A derivative function block that calculates the change in input per second.
DIVIDE	A divide function block that divides two signed integers.
EXOR2	An exclusive OR function that takes two inputs and provides two output values, the XOR of those values and the NOT of the output value.
FILTER	A first order low pass algorithm filter, with a programmable bandwidth in tenths of radians per second.
4AND	An AND function that takes four inputs and performs a logical AND.
4OR	An OR function that takes the logical OR of four inputs.
FUNCTION	A function that takes a user approximation for a function and linearly interpolates between two of five possible points.
INTEGRATOR	An integrator function block that does trapezoidal integration.
LIMIT	A limiter function block that limits an input to programmed minimum and maximum values.
LNOT	A logical NOT function.
MINMAX	A minimum or maximum function block that you can program to take the minimum or maximum of two input values.
MONOSTABLE	A one shot monostable function block that elongates a rising edge signal for a specified time duration.
MULTIPLEXER	A select function block that multiplexes one of four inputs based on the state of the selector inputs.
MULTIPLY	A multiply function block that multiplies two signed integers.
NO-OP	A PLC space holder.
PI CTRL	A proportional/integral control function block that takes the difference between two inputs and performs a PI control with a proportional and integral gains.
PULSE CNTR	A pulse counter function block that counts rising edges of an input value.
RATE LIMITER	A ramp function block that limits the rate of change of an input value.
SCALE	A scale function block that uses the following formula: IN1 $\times$ (MULTI/DIV).
SR FF	A set-reset flip-flop.
SUB	A subtract function block that subtracts two signed numbers.
T-FF	A toggle flip flop function block that changes the state of the input.
2ADD	An add function block that adds two signed numbers.
UP/DWN CNTR	An up/down counter function block that increments or decrements to a specified value in a specified amount of time.

In addition, each function block type also has parameters that are called I/O nodes associated with them. When you use a function block, the I/O nodes are created within the system. These I/O nodes are removed from the system when that function block is no longer in use. In all, the function block software can allow a total of 799 new node parameters in addition to the 493 linear parameters. You can modify and manipulate the node parameters to meet the needs of your particular application.

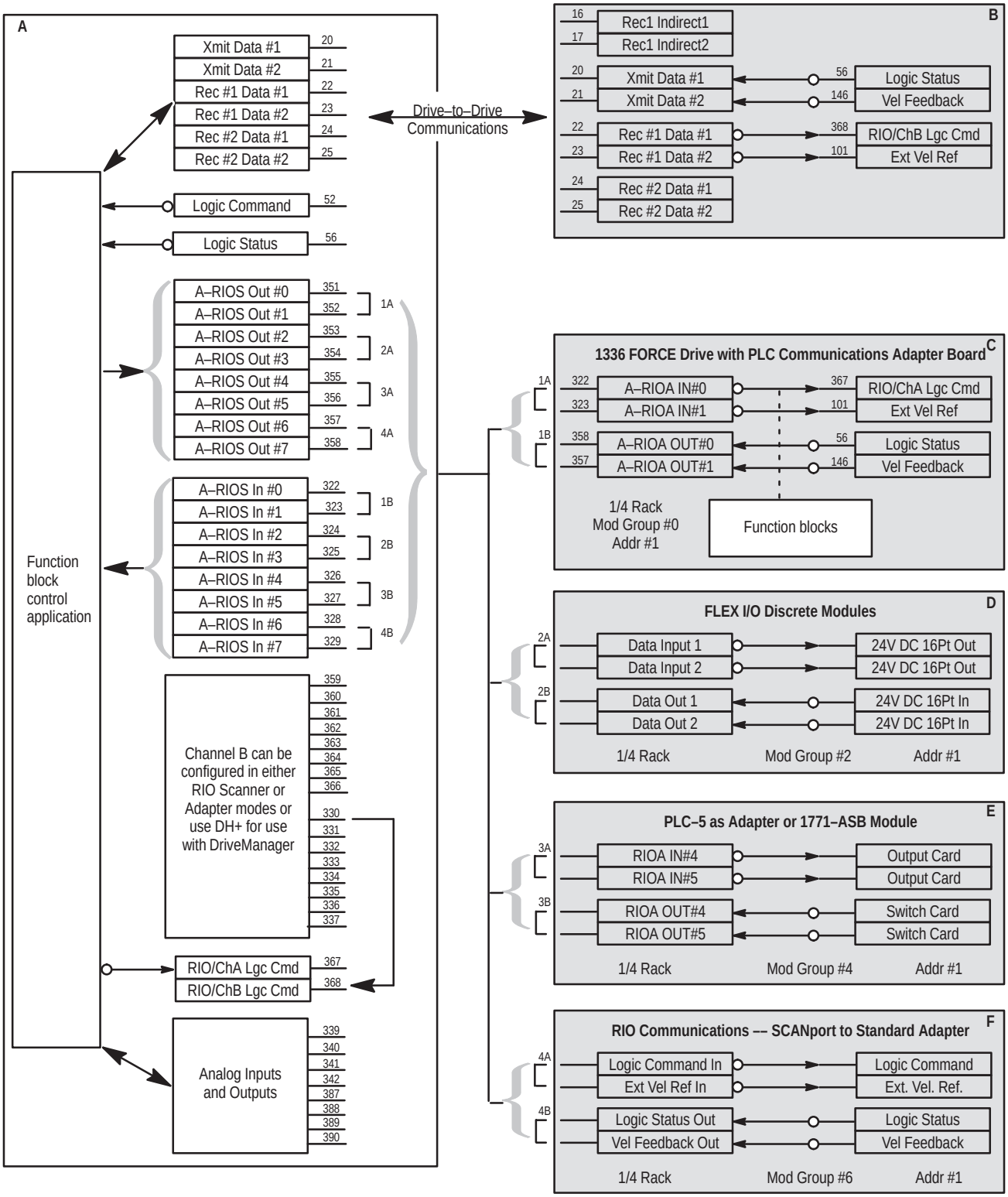
Using the function block node parameters requires that you create a function block application. A function block application is a combination of the function blocks that you want the drive to execute in the order that you want them executed. Each function block within an application is called an event, and you may have up to 128 events in your application. To create your application, you need to use a PC with the DriveTools' DriveBlockEditor software, a Bulletin 1201 Graphic Programming Terminal (GPT), or a PLC.

Once you have created your function block application, you need to download it to the drive where it is compiled into a function block program. When you download and compile the application, the PLC Communications Adapter Board creates the functionality and data sets within the drive. Once the application is running, each event is executed with a 20 millisecond task interval.

Note: You can only have one function block application executing in the drive at any given time.

Using System Resources

The following figure shows an example of a 1336 FORCE drive with a PLC Communications Adapter Board. Channel A is set up for scanner mode and is controlling other drives and adapters. A function block control application is also used.



In the previous figure:

- In Drive A, links were established between the function block control application and the drive I/O parameters.

  Channel A of Drive A is connected to four 1/4 rack adapters by daisy chaining a single blue hose. By setting up Drive A in scanner mode, Drive A can act as a master device and the 1/4 rack adapters can act as slave devices.
- Drive B is connected to Drive A using Drive–to–Drive communications via a DeviceNet cable. You can use Drive–to–Drive communications to connect any FORCE drive with either a Standard Adapter or a PLC Communications Adapter Board.
- Drive C is a 1336 FORCE drive with a PLC Communications Adapter Board. Channel A of Drive C is in adapter mode.
- Adapter D uses a 1794–ASB module to adapt the RIO image via blue hose to FLEX I/O. In this example, two words of image are used with the 24V DC FLEX I/O modules to increase discrete I/O.
- Adapter E suggests use with either a 1771–ASB module or a PLC–5 in an adapter mode for a 1/4 rack of image.
- Drive F uses a remote I/O communications (GD1) module as an adapter to convert the RIO image to SCANport parameters when interfacing with a FORCE drive with a standard adapter or a 1336 PLUS drive.

Parameters

Chapter Objectives

Chapter 6 provides information about the following:

- BRAM functions
- parameter definitions

BRAM Functions

BRAM, or Battery backed up Random Access Memory (also known as EEPROM), is memory that is retained when the power is removed from the system. User parameters, link fault information, reference stamp, process display information, and passwords are all stored in BRAM. The three available BRAM functions are:

- **BRAM Store**
  Stores current parameter value and links to BRAM.

Note: BRAM Jumper J3 must have a jumper on EN (enable) to store data to BRAM.

- **BRAM Recall**
  Updates the current values and links with parameter values and links stored in BRAM.
- **BRAM Initialize**
  Writes the factory set default values and links to RAM.

Parameter Listing

The following table lists the parameters in numerical order.

No.	Name	Group①	Page		No.	Name	Group①	Page
300	Adapter ID	1 — Adapter Info	6–12		344	Data Out A2	3 — SCANport I/O	6–21
301	Adapter Version	1 — Adapter Info	6–12		345	Data Out B1	3 — SCANport I/O	6–21
302	SP Comm Retries	1 — Adapter Info	6–12		346	Data Out B2	3 — SCANport I/O	6–21
303	ChA DIP Switch	7 — Channel A	6–12		347	Data Out C1	3 — SCANport I/O	6–21
304	ChB DIP Switch	8 — Channel B	6–12		348	Data Out C2	3 — SCANport I/O	6–22
305	ChA LED State	7 — Channel A	6–12		349	Data Out D1	3 — SCANport I/O	6–22
306	ChB LED State	8 — Channel B	6–13		350	Data Out D2	3 — SCANport I/O	6–22
307	PLC Comm Status	1 — Adapter Info	6–13		351	ChA RIO Out 0	7 — Channel A	6–22
309	Language Sel	1 — Adapter Info	6–13		352	ChA RIO Out 1	7 — Channel A	6–22
314	Data In A1	3 — SCANport I/O	6–13		353	ChA RIO Out 2	7 — Channel A	6–23
315	Data In A2	3 — SCANport I/O	6–13		354	ChA RIO Out 3	7 — Channel A	6–23
316	Data In B1	3 — SCANport I/O	6–13		355	ChA RIO Out 4	7 — Channel A	6–23
317	Data In B2	3 — SCANport I/O	6–14		356	ChA RIO Out 5	7 — Channel A	6–24
318	Data In C1	3 — SCANport I/O	6–14		357	ChA RIO Out 6	7 — Channel A	6–24
319	Data In C2	3 — SCANport I/O	6–14		358	ChA RIO Out 7	7 — Channel A	6–24
320	Data In D1	3 — SCANport I/O	6–14		359	ChB RIO Out 0	8 — Channel B	6–25
321	Data In D2	3 — SCANport I/O	6–14		360	ChB RIO Out 1	8 — Channel B	6–25
322	ChA RIO In 0	7 — Channel A	6–15		361	ChB RIO Out 2	8 — Channel B	6–25
323	ChA RIO In 1	7 — Channel A	6–15		362	ChB RIO Out 3	8 — Channel B	6–25
324	ChA RIO In 2	7 — Channel A	6–15		363	ChB RIO Out 4	8 — Channel B	6–26
325	ChA RIO In 3	7 — Channel A	6–16		364	ChB RIO Out 5	8 — Channel B	6–26
326	ChA RIO In 4	7 — Channel A	6–16		365	ChB RIO Out 6	8 — Channel B	6–26
327	ChA RIO In 5	7 — Channel A	6–16		366	ChB RIO Out 7	8 — Channel B	6–26
328	ChA RIO In 6	7 — Channel A	6–17		367	ChA Logic Cmd In	3 — SCANport I/O	6–27
329	ChA RIO In 7	7 — Channel A	6–17		368	ChB Logic Cmd In	3 — SCANport I/O	6–27
330	ChB RIO In 0	8 — Channel B	6–17		369	Stop Owner	5 — Owners	6–27
331	ChB RIO In 1	8 — Channel B	6–18		370	Dir Owner	5 — Owners	6–28
332	ChB RIO In 2	8 — Channel B	6–18		371	Start Owner	5 — Owners	6–28
333	ChB RIO In 3	8 — Channel B	6–18		372	Jog 1 Owner	5 — Owners	6–28
334	ChB RIO In 4	8 — Channel B	6–19		373	Jog 2 Owner	5 — Owners	6–28
335	ChB RIO In 5	8 — Channel B	6–19		374	Set Ref Owner	5 — Owners	6–28
336	ChB RIO In 6	8 — Channel B	6–19		375	Local Owner	5 — Owners	6–29
337	ChB RIO In 7	8 — Channel B	6–20		376	Flux Owner	5 — Owners	6–29
338	SP Analog In	3 — SCANport I/O	6–20		377	Trim Owner	5 — Owners	6–29
339	Analog In 1	6 — Analog I/O	6–20		378	Ramp Owner	5 — Owners	6–29
340	Analog In 2	6 — Analog I/O	6–20		379	Clr Fault Owner	5 — Owners	6–29
341	Analog In 3	6 — Analog I/O	6–20		386	SP Analog Out	3 — SCANport I/O	6–30
342	Analog In 4	6 — Analog I/O	6–21		387	Analog Out 1	6 — Analog I/O	6–30
343	Data Out A1	3 — SCANport I/O	6–21		388	Analog Out 2	6 — Analog I/O	6–30

① Parameters included in Groups 7 and 8 depend on the selected communications.

▶ Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

No.	Name	Group①	Page		No.	Name	Group①	Page
389	Analog Out 3	6 — Analog I/O	6–30		443	SP Warn Sts	2 — Adapter Diagnostics	6–46
390	Analog Out 4	6 — Analog I/O	6–30		454	Trend In 1	9 — Trend I/O	6–46
391	SP Analog Sel	3 — SCANport I/O	6–31		455	Tr1 Opnd Parm X	9 — Trend Setup	6–46
392	An In 1 Offset	6 — Analog I/O	6–31		456	Tr1 Opnd Parm Y	9 — Trend Setup	6–47
393	An In 1 Scale	6 — Analog I/O	6–31		457	Tr1 Operator	9 — Trend Setup	6–47
394	An In 2 Offset	6 — Analog I/O	6–31		458	Tr1 Sample Rate	9 — Trend Setup	6–47
395	An In 2 Scale	6 — Analog I/O	6–32		459	Tr1 Post Samples	9 — Trend Setup	6–47
396	An In 3 Offset	6 — Analog I/O	6–32		460	Tr1 Cont Trigger	9 — Trend Setup	6–48
397	An In 3 Scale	6 — Analog I/O	6–32		461	Tr1 Select	9 — Trend Setup	6–48
398	An In 4 Offset	6 — Analog I/O	6–32		462	Tr1 Status	9 — Trend I/O	6–48
399	An In 4 Scale	6 — Analog I/O	6–33		463	Trend Out 1	9 — Trend I/O	6–48
400	An Out 1 Offset	6 — Analog I/O	6–33		464	Trend In 2	9 — Trend I/O	6–49
401	An Out 1 Scale	6 — Analog I/O	6–33		465	Tr2 Opnd Parm X	9 — Trend Setup	6–49
402	An Out 2 Offset	6 — Analog I/O	6–33		466	Tr2 Opnd Parm Y	9 — Trend Setup	6–49
403	An Out 2 Scale	6 — Analog I/O	6–34		467	Tr2 Operator	9 — Trend Setup	6–49
404	An Out 3 Offset	6 — Analog I/O	6–34		468	Tr2 Sample Rate	9 — Trend Setup	6–50
405	An Out 3 Scale	6 — Analog I/O	6–34		469	Tr2 Post Samples	9 — Trend Setup	6–50
406	An Out 4 Offset	6 — Analog I/O	6–34		470	Tr2 Cont Trigger	9 — Trend Setup	6–50
407	An Out 4 Scale	6 — Analog I/O	6–35		471	Tr2 Select	9 — Trend Setup	6–50
408	Port Enable	4 — Masks	6–35		472	Tr2 Status	9 — Trend I/O	6–50
409	Dir Mask	4 — Masks	6–35		473	Trend Out 2	9 — Trend I/O	6–51
410	Start Mask	4 — Masks	6–35		474	Trend In 3	9 — Trend I/O	6–51
411	Jog Mask	4 — Masks	6–36		475	Tr3 Opnd Parm X	9 — Trend Setup	6–51
412	Ref Mask	4 — Masks	6–36		476	Tr3 Opnd Parm Y	9 — Trend Setup	6–51
413	Clr Fault Mask	4 — Masks	6–36		477	Tr3 Operator	9 — Trend Setup	6–52
414	Reset Drive Mask	4 — Masks	6–36		478	Tr3 Sample Rate	9 — Trend Setup	6–52
415	Local Mask	4 — Masks	6–36		479	Tr3 Post Samples	9 — Trend Setup	6–52
416	SP Default Ref	3 — Velocity Ref	6–37		480	Tr3 Cont Trigger	9 — Trend Setup	6–52
425	ChA RIO Flt Sel	2 — Adapter Diagnostics	6–38		481	Tr3 Select	9 — Trend Setup	6–53
426	ChA RIO Warn Sel	2 — Adapter Diagnostics	6–39		482	Tr3 Status	9 — Trend I/O	6–53
427	Redund Chan No	7 — Channel A	6–40		483	Trend Out 3	9 — Trend I/O	6–53
430	ChB RIO Flt Sel	2 — Adapter Diagnostics	6–41		484	Trend In 4	9 — Trend I/O	6–53
431	ChB RIO Warn Sel	2 — Adapter Diagnostics	6–42		485	Tr4 Opnd Parm X	9 — Trend Setup	6–54
432	ChB RIOS Retries	8 — Channel B	6–43		486	Tr4 Opnd Parm Y	9 — Trend Setup	6–54
435	DIP Fault Setup	2 — Adapter Diagnostics	6–43		487	Tr4 Operator	9 — Trend Setup	6–54
436	ChA Fault Sts	2 — Adapter Diagnostics	6–43		488	Tr4 Sample Rate	9 — Trend Setup	6–54
437	ChA Warn Sts	2 — Adapter Diagnostics	6–44		489	Tr4 Post Samples	9 — Trend Setup	6–55
438	ChB Fault Sts	2 — Adapter Diagnostics	6–44		490	Tr4 Cont Trigger	9 — Trend Setup	6–55
439	ChB Warn Sts	2 — Adapter Diagnostics	6–45		491	Tr4 Select	9 — Trend Setup	6–55
440	SP Fault Sel	2 — Adapter Diagnostics	6–45		492	Tr4 Status	9 — Trend I/O	6–55
441	SP Warn Sel	2 — Adapter Diagnostics	6–45		493	Trend Out 4	9 — Trend I/O	6–56
442	SP Fault Sts	2 — Adapter Diagnostics	6–46					

① Parameters included in Groups 7 and 8 depend on the selected communications.

▶ Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

Parameter Files and Groups

Parameters are divided into four files to help ease programming and operator access. The four files are:

- Startup file
- Communications I/O file
- Velocity Torque file
- Diagnostics file

These files are divided into groups, and each parameter is an element in a specific group. Parameters may be used as elements in more than one group.

You can also view the parameters in a linear mode. This allows you to view the entire parameter table in numerical order. For additional information on parameter viewing modes, refer to the 1336 FORCE User Manual.

The following tables list the parameters that are available in each file and group. Descriptions of the shaded parameters are located in the 1336 FORCE User Manual.

File 1 – Startup①

Drive Data Group		Drive Tune Group		Limits Group	
Language Sel	309	Autotun Diag Sel	256	Accel Time	125
Encoder PPR	235	Vel Feedback	146	Decel Time	126
Base Motor Speed	229	Vel Desired BW	43	Logic Options	59
Base Motor HP	228	Auto Tune Status	44	Fwd Speed Limit	128
Base Motor Curr	230	Motor Inertia	234	Rev Speed Limit	127
Base Motor Volt	231	Total Inertia	46	Pos Mtr Cur Lmt	179
Base Motor Freq	232	Ki Velocity Loop	139	Neg Mtr Cur Lmt	180
Motor Poles	233	Kp Velocity Loop	140	Pos Mtr Tor Lmt	175
Torque Mode Sel	53	Kf Velocity Loop	141	Neg Mtr Tor Lmt	176
		Vel Damp Factor	45	Motor Power Lmt	177
		Auto Tune Speed	41	Regen Power Lmt	178
		Ph Rot Cur Ref	262	Di/Dt Limit	181
		Ph Rot Freq Ref	263	Min Flux Level	174

Fault Setup Group		Monitor Group		
CP Flt/Warn Cfg	86	Filt Vel Fdbk	269	
CP Warn/None Cfg	88	Scaled Vel Fdbk	147	
VP Flt/Warn Cfg	87	Int Torque Ref	167	
VP Warn/None Cfg	89	Internal Iq Ref	168	
Absolute Overspd	90	Computed Power	182	
Stall Delay	91	DC Bus Voltage	268	
Mtr Overload Lim	92	Motor Volt Fdbk	265	
Mtr Overload Spd1	95	Motor Curr Fdbk	264	
Mtr Overload Spd2	96	Freq Command	266	
Min Overload Lmt	97	Inv Temp Fdbk	270	
Service Factor	94	Torque Mode Stat	184	
		Lim Motor Flux	271	
		Enc Pos Fdbk Low	148	
		Enc Pos Fdbk Hi	149	
		MCB Counter	8	

① Descriptions of the shaded parameters are located in the 1336 FORCE user manual.

File 2 – Communications I/O[1]

Channel A Group[2]		Channel B Group[2]		Logic Group		Analog Input Group		Analog Output Group	
ChA RIO In 0	322	ChB RIO In 0	330	ChA Logic Cmd In	367	Analog In 1	339	Analog Out 1	387
ChA RIO In 1	323	ChB RIO In 1	331	ChB Logic Cmd In	368	An In 1 Offset	392	An Out 1 Offset	400
ChA RIO In 2	324	ChB RIO In 2	332	Logic Command	52	An In 1 Scale	393	An Out 1 Scale	401
ChA RIO In 3	325	ChB RIO In 3	333	Logic Status Low	56	Analog In 2	340	Analog Out 2	388
ChA RIO In 4	326	ChB RIO In 4	334	Logic Status Hi	57	An In 2 Offset	394	An Out 2 Offset	402
ChA RIO In 5	327	ChB RIO In 5	335	Logic Options	59	An In 2 Scale	395	An Out 2 Scale	403
ChA RIO In 6	328	ChB RIO In 6	336			Analog In 3	341	Analog Out 3	389
ChA RIO In 7	329	ChB RIO In 7	337			An In 3 Offset	396	An Out 3 Offset	404
ChA RIO Out 0	351	ChB RIO Out 0	359			An In 3 Scale	397	An Out 3 Scale	405
ChA RIO Out 1	352	ChB RIO Out 1	360			Analog In 4	342	Analog Out 4	390
ChA RIO Out 2	353	ChB RIO Out 2	361			An In 4 Offset	398	An Out 4 Offset	406
ChA RIO Out 3	354	ChB RIO Out 3	362			An In 4 Scale	399	An Out 4 Scale	407
ChA RIO Out 4	355	ChB RIO Out 4	363			SP Analog In	338	SP Analog Out	386
ChA RIO Out 5	356	ChB RIO Out 5	364			SP Analog Sel	391		
ChA RIO Out 6	357	ChB RIO Out 6	365						
ChA RIO Out 7	358	ChB RIO Out 7	366						
Redund Chan[4]	427								

Drv – Drv		Fault Sel/Sts[3]		SCANport Owners		SCANport Masks		SCANport I/O	
D2D Tsk Interval	9	ChA Fault Sts	436	Stop Owner	369	Port Enable Mask	408	Data In A1	314
D2D Baud Rate	10	ChA Warn Sts	437	Start Owner	371	Start Mask	410	Data In A2	315
D2D Xmit Addr	11	ChB Fault Sts	438	Jog1 Owner	372	Jog Mask	411	Data In B1	316
D2D Xmit Ind 1	14	ChB Warn Sts	439	Jog2 Owner	373	Direction Mask	409	Data In B2	317
D2D Xmit Data 1	20	SP Fault Sts	442	Direction Owner	370	Reference Mask	412	Data In C1	318
D2D Xmit Ind 2	15	SP Warn Sts	443	Set Ref Owner	374	Local Mask	415	Data In C2	319
D2D Xmit Data 2	21	SP Fault Sel	440	Local Owner	375	Clear Fault Mask	413	Data In D1	320
D2D Rcv 1 Addr	12	SP Warn Sel	441	Flux Owner	376	Reset Drive Mask	414	Data In D2	321
D2D Rcv 1 Ind 1	16	ChA Flt Sel	425	Trim Owner	377			Data Out A1	343
D2D Rcv 1 Data 1	22	ChA Warn Sel	426	Ramp Owner	378			Data Out A2	344
D2D Rcv 1 Ind 2	17	ChB Flt Sel	430	Clr Fault Owner	379			Data Out B1	345
D2D Rcv 2 Data 2	23	ChB Warn Sel	431					Data Out B2	346
D2D Rcv 2 Addr	13	CP Flt Status	82					Data Out C1	347
D2D Rcv 2 Ind 1	18	VP Flt Status	83					Data Out C2	348
D2D Rcv 2 Data 1	24	CP Warn Status	84					Data Out D1	349
D2D Rcv 2 Ind 2	19	VP Warn Status	85					Data Out D2	350
D2D Rcv 2 Data 2	25	CP Flt/Warn Cfg	86						
		CP Warn/None Cfg	87						
		VP Flt/Warn Cfg	88						
		VP Warn/None Cfg	89						
		Nofig Flt Status	81						
		Pwrup Flt Status	80						
		Max DB Power	77						
		Max DB Temp	78						
		DB Time Const	79						

[1] Descriptions of the shaded parameters are located in the 1336 FORCE user manual.
[2] These group(s) may or may not exist due to protocol DIP switch configuration.
[3] The number of elements in this group will vary depending on how you configure the channels.
[4] Redund Chan is only available in redundant RIO configuration.

File 3 – Velocity Torque[1]

Velocity Ref		Logic		Velocity Fdbk		Velocity Reg		Torque Ref	
Preset Speed 1	119	ChA Logic Cmd In	367	Filt Vel Fdbk	269	Vel Reg Output	134	Torque Mode Sel	53
Preset Speed 2	120	ChB Logic Cmd In	368	Vel Feedback	146	Ki Velocity Loop	139	Torq Mode Stat	184
Preset Speed 3	121	Logic Command	52	Scaled Vel Fdbk	147	Kp Velocity Loop	140	Pos Mtr Cur Lmt	179
Preset Speed 4	122	Torq Stop Confg	58	Enc Pos Fdbk Low	148	Kf Velocity Loop	141	Neg Mtr Cur Lmt	180
Preset Speed 5	123	Logic Options	59	Enc Pos Fdbk Hi	149	Velocity Error	138	Int Torque Ref	167
Jog Speed 1	117	Logic Status Low	56	Fdbk Track Gain	151	Vel Reg TP Sel	137	Internal Iq Ref	168
Jog Speed 2	118	Logic Status Hi	57	Fdbk Filter Gain	153	Vel Reg TP Low	135	Computed Power	182
Vel Ref 1 Low	100	At Setpoint 1	60	Fdbk Filter BW	154	Vel Reg TP Hi	136	Torq Lmt Stat	183
Vel Ref 1 Hi	101	At Setpoint 2	61	Fdbk Device Type	150			External Iq Ref	161
Vel Ref 2 Low	103	Over Setpoint 1	62	Fdbk Filter Sel	152			Ext Torq Ref 1	162
Vel Ref 2 Hi	104	Over Setpoint 2	63	Tach Velocity	155			Ext Torq Ref 2	164
Vel Scale Fctr 1	102	Over Setpoint 3	64	Error Filter BW	142			Slave Torque % 1	163
Vel Scale Fctr 2	105	Over Setpoint 4	65	Vel Fdbk TP Sel	145			Slave Torque % 2	165
Vel Trim Low	106	Setpoint Select	66	Vel Fdbk TP Low	143			Ext Torque Step	166
Vel Trim Hi	107	Speed Setpnt Tol	67	Vel Fdbk TP Hi	144			Notch Filter Freq	156
Vel Ref Out Low	132	Cur Setpoint Tol	68					Notch Filter Q	157
Vel Ref Out Hi	133	Zero Speed Tol	69					Min Flux Level	174
Accel Time	125	Local In Status	54					Pos Mtr Tor Lmt	175
Decel Time	126	Stop Dwell	72					Neg Mtr Tor Lmt	176
Fwd Speed Limit	128	Local Out Status	55					Motor Power Lmt	177
Rev Speed Limit	127	Logic Tstpt Sel	71					Regen Power Lmt	178
Max Rev Spd Trim	129	Logic Tstpt Data	70					Di/Dt Limit	181
Max Fwd Spd Trim	130							Torq Ref TP Sel	173
Droop Percent	131							Torque Ref TP	172
Vel Ref TP Sel	110								
Vel Ref TP Low	108								
Vel Ref TP Hi	109								
SP Default Ref	416								

[1] Descriptions of the shaded parameters are located in the 1336 FORCE user manual.

Torque Block①		Process Trim		Torque Autotune		Velocity Autotune	
PWM Frequency	222	Proc Trim Ref	27	Autotun Diag Sel	256	Autotun Diag Sel	256
Prech Rdthru Sel	223	Proc Trim Fdbk	28	Ph Rot Cur Ref	262	Auto Tune Torque	40
Under Volt Stpnt	224	Proc Trim Output	26	Auto Tune Torque	40	Auto Tune Speed	41
Prechrg Timeout	225	Proc Trim Select	29	Auto Tune Speed	41	Total Inertia	46
Ridethru Timeout	226	Proc Trim Ki	32	Ph Rot Freq Ref	263	Motor Inertia	234
CP Options	227	Proc Trim Kp	33	Phs Test Rot Error	294	Auto Tune Status	44
Ki Freq Reg	287	Proc Trim Lo Lmt	34	Lo Test Error	295	Vel Desired BW	43
Kp Freq Reg	288	Proc Trim Hi Lmt	35	Rs Test Error	296	Vel Damp Factor	45
Kff Freq Reg	289	Proc Trim Fltr W	30	Id Test Error	297	Ki Velocity Loop	139
Ksel Freq Reg	290	Proc Trim Data	31	Torq Calc Error	298	Kp Velocity Loop	140
Freq Track Filt	291	Proc Trim Out K	36	Stator Res	236	Kf Velocity Loop	141
Track Filt Type	292	Proc Trim TP Sel	38	Leakage Ind	237	Auto Tune TP Sel	48
Freq Trim Filter	293	Proc Trim TP	37	Base Flux Cur	238	Auto Tune TP	47
				Base Torque Cur	240		
				Base Torque Volt	241		
				Base Flux Volt	242		
				Vde Max	243		
				Vqe Max	244		
				Vde Min	245		
				Base Slip Freq	246		
				Base Slip Fr Max	247		
				Base Slip Fr Min	248		
				Kp Slip	249		
				Ki Slip	250		
				Kp Flux	251		
				Ki Flux	252		
				Torq TP Sel 1	273		
				Torq TP Data 1	274		

① Descriptions of the shaded parameters are located in the 1336 FORCE user manual.

File 4 – Diagnostics[1]

Monitor		Testpoints		Fault Sel/Sts		Motor Overload	
Filt Vel Fdbk	269	Vel Fdbk TP Sel	145	ChA Flt Sts	436	Mtr Overload Lim	92
Scaled Vel Fdbk	147	Vel Fdbk TP Low	143	ChA Warn Sts	437	Mtr Overld Spd 1	95
Int Torque Ref	167	Vel Fdbk TP Hi	144	ChB Flt Sts	438	Mtr Overld Spd 2	96
Internal Iq Ref	168	Vel Reg TP Sel	137	ChB Warn Sts	439	Min Overload Lmt	97
Computed Power	182	Vel Reg TP Low	135	SP Fault Sts	442	Service Factor	94
DC Bus Voltage	268	Vel Reg TP Hi	136	SP Warn Sts	443		
Motor Volt Fdbk	265	Vel Ref TP Sel	110	SP Fault Sel	440		
Motor Curr Fdbk	264	Vel Ref TP Low	108	SP Warn Sel	441		
Freq Command	266	Vel Ref TP Hi	109	ChA Flt Sel	425		
Inv Temp Fdbk	270	Auto Tune TP Sel	47	ChB Flt Sel	430		
Torq Mode Stat	184	Auto Tune TP Data	48	ChA Warn Sel	426		
Lim Motor Flux	271	Logic Tstpt Sel	71	ChB Warn Sel	431		
Enc Pos Fdbk Low	148	Logic Tstpt Data	70	CP Flt Status	82		
Enc Pos Fdbk Hi	149	Fault TP Sel	99	VP Flt Status	83		
MCB Counter	8	Fault TP	98	CP Warn Status	84		
		Torq Ref TP Sel	173	VP Warn Status	85		
		Torque Ref TP	172	CP Flt/Warn Cfg	86		
		Torq TP Sel 1	273	CP Warn/None Cfg	87		
		Torq TP Data 1	274	VP Flt/Warn Cfg	88		
				VP Warn/None Cfg	89		
				Nofig Flt Status	81		
				Pwrup Flt Status	80		
				Max DB Power	77		
				Max DB Temp	78		
				DB Time Const	79		

[1] Descriptions of the shaded parameters are located in the 1336 FORCE user manual.

Transistor Diag		Trend I/O		Trend Setup		Info	
Autotun Diag Sel	256	Tr1 Status	462	Tr1 Opnd Parm X	455	Drive SW Version	1
Logic Options	59	Tr2 Status	472	Tr1 Opnd Parm Y	456	Drive Type	5
Tran Diag Disabl	257	Tr3 Status	482	Tr1 Operator	457	Base Drive Curr	220
Inverter Diag 1	258	Tr4 Status	492	Tr1 Sample Rate	458	Base Line Volt	221
Inverter Diag 2	259	Trend In 1	454	Tr1 Post Samples	459	Adapter Version	301
Iq Offset	260	Trend In 2	464	Tr1 Cont Trigger	460	Adapter ID	300
Id Offset	261	Trend In 3	474	Tr1 Select	461	Language Sel	309
		Trend In 4	484	Tr2 Opnd Parm X	465	SP Comm Retries	302
		Trend Out 1	463	Tr2 Opnd Parm Y	466	PLC Comm Status	307
		Trend Out 2	473	Tr2 Operator	467	ChA LED State	305
		Trend Out 3	483	Tr2 Sample Rate	468	DIP Switch ChA	303
		Trend Out 4	493	Tr2 Post Samples	469	ChB LED State	306
				Tr2 Cont Trigger	470	DIP Switch ChB	304
				Tr2 Select	471	DIP Fault Setup	435
				Tr3 Opnd Parm X	475		
				Tr3 Opnd Parm Y	476		
				Tr3 Operator	477		
				Tr3 Sample Rate	478		
				Tr3 Post Samples	479		
				Tr3 Cont Trigger	480		
				Tr3 Select	481		
				Tr4 Opnd Parm X	485		
				Tr4 Opnd Parm Y	486		
				Tr4 Operator	487		
				Tr4 Sample Rate	488		
				Tr4 Post Samples	489		
				Tr4 Cont Trigger	490		
				Tr4 Select	491		

① Descriptions of the shaded parameters are located in the 1336 FORCE user manual.

Parameter Conventions

The remainder of this chapter describes the parameters associated with the PLC Communications Adapter Board. For parameters not listed in this section, refer to the parameter descriptions in your 1336 FORCE user manual.

Parameter descriptions adhere to the following conventions.

Par #	**[Parameter Name]**		
	Parameter description.		
	Parameter Number	①	#
	Parameter Type	②	Read Only or Read/Write
	Display Units / Drive Units	④, ⑤	User Units / Internal Drive Units
	Factory Default	③	Drive Factory Setting
	Minimum Value	⑥	Minimum Value Acceptable
	Maximum Value	⑦	Maximum Value Acceptable
	File – Group	⑧	File and Group that Parameter Is In
	Enums	⑨	Values

① **Parameter Number** Each parameter is assigned a number. The number can be used for process display set up, fault buffer interpretation, or serial communications.

② **Parameter Type** Two types of parameters are available:

Read Only The value is changed only by the drive and is used to monitor values.

Read/Write The value is changed through programming. This type can also be used to monitor a value.

③ **Factory Default** This is the value assigned to each parameter at the factory.

④ **Display Units** These are the units that appear on the HIM display. Two types exist:

ENUMS A language statement pertaining to the selection made or language description of bit function.

Engineering Standard units such as: Hz, seconds, volts, etc.

⑤ **Drive Units** These are internal units used to communicate through the serial port and to scale values properly when reading or writing to the drive.

⑥ **Minimum Value** This is the lowest setting possible for the parameter.

⑦ **Maximum Value** This is the highest setting possible for the parameter.

⑧ **File – Group** This lists the File and Group where the parameter is located. A parameter may be listed in more than one File and Group.

⑨ **Enums** This lists the bit values that you can use and the associated meanings.

300 Adapter ID
[Adapter ID]

Adapter ID displays the identifier for the PLC Communications Adapter Board.

Parameter Number	300
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	1
File – Group	Diagnostics – Info

301 Adapter Version
[Adapter Version]

Adapter Version displays the current firmware version of the PLC Communications Adapter Board.

Parameter Number	301
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	2.XX
Minimum Value	0.00
Maximum Value	9.99
File – Group	Diagnostics – Info

302 SCANport Communications Retries
[SP Comm Retries]

SP Comm Retries counts the number of communication retries for all entries in the SCANport scan list.

Parameter Number	302
Parameter Type	Read, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535
File – Group	Diagnostics – Info

303 Channel A DIP Switch
[ChA DIP Switch]

ChA DIP Switch displays the current DIP switch settings for Channel A of the PLC Communications Adapter Board. The two groups of numbers on the left represent block U2, and the two groups on the right represent block U3.

Parameter Number	303
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
File – Group	Diagnostics – Info

304 Channel B DIP Switch
[ChB DIP Switch]

ChB DIP Switch displays the current DIP switch settings for Channel B of the PLC Communications Adapter Board. The two groups of numbers on the left represent block U4, and the two groups on the right represent block U5.

Parameter Number	304
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
File – Group	Diagnostics – Info

305 Channel A LED State
[ChA LED State]

ChA LED State displays the current LED state for channel A. The LED states correspond to LEDs D8, D10, and D12 on the PLC Communications Adapter Board.

Parameter Number	305
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	5
File – Group	Diagnostics – Info
Enums	0 = Off, 1 = Red, 2 = Green, 3 = Yellow, 4 = Flash Green, 5 = Flash Red

306 Channel B LED State
[ChB LED State]

ChB LED State displays the current LED state for channel B. The LED states correspond to LEDs D13, D14, and D15 on the PLC Communications Adapter Board.

Parameter Number	306
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	5
File – Group	Diagnostics – Info

Enums 0 = Off, 1 = Red, 2 = Green, 3 = Yellow, 4 = Flash Green, 5 = Flash Red

307 PLC Communications Board Status
[PLC Comm Status]

PLC Comm Status displays the status of the PLC Communications Adapter Board. You can use this parameter to determine if no fault occurred, or if a warning, soft fault, or hard fault occurred.

Parameter Number	307
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	3
File – Group	Diagnostics – Info

Enums 0 = No Faults, 1 = Drv Warning, 2 = Drv Soft Flt, 3 = Drv Hard Flt

309 Language Select
[Language Sel]

You can use Language Sel to choose the language you want the PLC Communications Adapter Board to use for parameter and fault display text. Currently, only English is available.

Parameter Number	309
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Startup – Drive Data Group Diagnostics – Info

Enums 0 = English, 1 = Alternate Language (not currently available)

314 Data Input A1
[Data In A1]

Data In A1 contains the first image word from the SCANport output image table.

Parameter Number	314
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

315 Data Input A2
[Data In A2]

Data In A2 contains the second image word from the SCANport output image table.

Parameter Number	315
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

316 Data Input B1
[Data In B1]

Data In B1 contains the third image word from the SCANport output image table.

Parameter Number	316
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

317 Data Input B2
[Data In B2]

Data In B2 contains the fourth image word from the SCANport output image table.

Parameter Number	317
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

318 Data Input C1
[Data In C1]

Data In C1 contains the fifth image word from the SCANport output image table.

Parameter Number	318
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

319 Data Input C2
[Data In C2]

Data In C2 contains the sixth image word from the SCANport output image table.

Parameter Number	319
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

320 Data Input D1
[Data In D1]

Data In D1 contains the seventh image word from the SCANport output image table.

Parameter Number	320
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

321 Data Input D2
[Data In D2]

Data In D2 contains the eighth image word from the SCANport output image table.

Parameter Number	321
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

322 Channel A Remote I/O Input 0

[ChA RIOA In 0] — adapter mode

[ChA RIOS In 0] — scanner mode

ChA RIOx In 0 contains the first word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	322①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

323 Channel A Remote I/O Input 1

[ChA RIOA In 1] — adapter mode

[ChA RIOS In 1] — scanner mode

ChA RIOx In 1 contains the second word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	323①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

324 Channel A Remote I/O Input 2

[ChA RIOA In 2] — adapter mode

[ChA RIOS In 2] — scanner mode

ChA RIOx In 2 contains the third word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	324①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

325 Channel A Remote I/O Input 3

[ChA RIOA In 3] — adapter mode
[ChA RIOS In 3] — scanner mode

ChA RIOx In 3 contains the fourth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	325①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

326 Channel A Remote I/O Input 4

[ChA RIOA In 4] — adapter mode
[ChA RIOS In 4] — scanner mode

ChA RIOx In 4 contains the fifth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	326①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

327 Channel A Remote I/O Input 5

[ChA RIOA In 5] — adapter mode
[ChA RIOS In 5] — scanner mode

ChA RIOx In 5 contains the sixth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	327①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

328 Channel A Remote I/O Input 6

[ChA RIOA In 6] — adapter mode

[ChA RIOS In 6] — scanner mode

ChA RIOx In 6 contains the seventh word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	328①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

329 Channel A Remote I/O Input 7

[ChA RIOA In 7] — adapter mode

[ChA RIOS In 7] — scanner mode

ChA RIOx In 7 contains the eighth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	329①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

330 Channel B Remote I/O Input 0

[ChB RIOA In 0] — adapter mode

[ChB RIOS In 0] — scanner mode

ChB RIOx In 0 contains the first word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	330①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

331 Channel B Remote I/O Input 1

[ChB RIOA In 1] — adapter mode
[ChB RIOS In 1] — scanner mode

ChB RIOx In 1 contains the second word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	331①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

332 Channel B Remote I/O Input 2

[ChB RIOA In 2] — adapter mode
[ChB RIOS In 2] — scanner mode

ChB RIOx In 2 contains the third word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	332①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

333 Channel B Remote I/O Input 3

[ChB RIOA In 3] — adapter mode
[ChB RIOS In 3] — scanner mode

ChB RIOx In 3 contains the fourth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	333①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

334 Channel B Remote I/O Input 4

[ChB RIOA In 4] — adapter mode

[ChB RIOS In 4] — scanner mode

ChB RIOx In 4 contains the fifth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	334①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

335 Channel B Remote I/O Input 5

[ChB RIOA In 5] — adapter mode

[ChB RIOS In 5] — scanner mode

ChB RIOx In 5 contains the sixth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	335①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

336 Channel B Remote I/O Input 6

[ChB RIOA In 6] — adapter mode

[ChB RIOS In 6] — scanner mode

ChB RIOx In 6 contains the seventh word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	336①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

337 Channel B Remote I/O Input 7

[ChB RIOA In 7] — adapter mode

[ChB RIOS In 7] — scanner mode

ChB RIOx In 7 contains the eighth word or data group from the PLC controller output image table. The RIO scanner transfers the data to the drive every rack scan. The PLC Communications Adapter Board can use this value directly. Other drive functions can use this value through a configuration link.

Parameter Number	337①
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

338 SCANport Analog Input

[SP Analog In]

SP Analog In converts a +10V analog input value to a +32767 value. You can then link this digital value to one of the 1336 FORCE input parameters.

Parameter Number	338
Parameter Type	Read Only, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Input

339 Analog Input 1

[Analog In 1]

Analog In 1 displays the result of converting a ±10V signal to a ±32767 value using Analog In 1 Scale (parameter 393) and Analog In 1 Offset (parameter 392). You can link this digital value to other 1336 FORCE parameters.

Parameter Number	339
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Input

340 Analog Input 2

[Analog In 2]

Analog In 2 displays the result of converting a ±10V signal to a ±32767 value using Analog In 2 Scale (parameter 395) and Analog In 2 Offset (parameter 394). You can link this digital value to other 1336 FORCE parameters.

Parameter Number	340
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Input

341 Analog Input 3

[Analog In 3]

Analog In 3 displays the result of converting a ±10V signal to a ±32767 value using Analog In 3 Scale (parameter 397) and Analog In 3 Offset (parameter 396). You can link this digital value to other 1336 FORCE parameters.

Parameter Number	341
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Input

342 Analog Input 4
[Analog In 4]

Analog In 4 displays the result of converting a ±10V signal to a ±32767 value using Analog In 4 Scale (parameter 399) and Analog In 4 Offset (parameter 398). You can link this digital value to other 1336 FORCE parameters.

Parameter Number	342
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Input

343 Data Output A1
[Data Out A1]

Data Out A1 contains the first image word from the SCANport input image table.

Parameter Number	343
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

344 Data Output A2
[Data Out A2]

Data Out A2 contains the second image word from the SCANport input image table.

Parameter Number	344
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

345 Data Output B1
[Data Out B1]

Data Out B1 contains the third image word from the SCANport input image table.

Parameter Number	345
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

346 Data Output B2
[Data Out B2]

Data Out B2 contains the fourth image word from the SCANport input image table.

Parameter Number	346
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

347 Data Output C1
[Data Out C1]

Data Out C1 contains the fifth image word from the SCANport input image table.

Parameter Number	347
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

348 Data Output C2
[Data Out C2]

Data Out C2 contains the sixth image word from the SCANport input image table.

Parameter Number	348
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

349 Data Output D1
[Data Out D1]

Data Out D1 contains the seventh image word from the SCANport input image table.

Parameter Number	349
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

350 Data Output D2
[Data Out D2]

Data Out D2 contains the eighth image word from the SCANport input image table.

Parameter Number	350
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – SCANport I/O

351 Channel A Remote I/O Output 0
[ChA RIOA Out 0] — adapter mode
[ChA/B RIOA Out0] — adapter mode with redundancy
[ChA RIOS Out 0] — scanner mode

ChA RIOx Out 0 contains the first word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	351①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.
NOTE:If Channel A (B) is configured as RIOA w/Block transfer, this parameter is defined as a source parameter to prevent accidental linking and unpredictable Block Transfer behavior.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

352 Channel A Remote I/O Output 1
[ChA RIOA Out 1] — adapter mode
[ChA/B RIOA Out1] — adapter mode with redundancy
[ChA RIOS Out 1] — scanner mode

ChA RIOx Out 1 contains the second word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	352①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

353 Channel A Remote I/O Output 2

[ChA RIOA Out 2] — adapter mode
[ChA/B RIOA Out2] — adapter mode with redundancy
[ChA RIOS Out 2] — scanner mode

ChA RIOx Out 2 contains the third word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	353①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

354 Channel A Remote I/O Output 3

[ChA RIOA Out 3] — adapter mode
[ChA/B RIOA Out3] — adapter mode with redundancy
[ChA RIOS Out 3] — scanner mode

ChA RIOx Out 3 contains the fourth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	354①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

355 Channel A Remote I/O Output 4

[ChA RIOA Out 4] — adapter mode
[ChA/B RIOA Out4] — adapter mode with redundancy
[ChA RIOS Out 4] — scanner mode

ChA RIOx Out 4 contains the fifth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	355①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

356 Channel A Remote I/O Output 5

[ChA RIOA Out 5] — adapter mode
[ChA/B RIOA Out5] — adapter mode with redundancy
[ChA RIOS Out 5] — scanner mode

ChA RIOx Out 5 contains the sixth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	356①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

357 Channel A Remote I/O Output 6

[ChA RIOA Out 6] — adapter mode
[ChA/B RIOA Out6] — adapter mode with redundancy
[ChA RIOS Out 6] — scanner mode

ChA RIOx Out 6 contains the seventh word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	357①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

358 Channel A Remote I/O Output 7

[ChA RIOA Out 7] — adapter mode
[ChA/B RIOA Out7] — adapter mode with redundancy
[ChA RIOS Out 7] — scanner mode

ChA RIOx Out 7 contains the eighth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	358①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel A

① This parameter is not available if you set up channel A for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

359 Channel B Remote I/O Output 0

[ChB RIOA Out 0] — adapter mode

[ChB RIOS Out 0] — scanner mode

ChB RIOx Out 0 contains the first word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	359①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.
NOTE: If Channel B (A) is configured as RIOA w/Block transfer, this parameter is defined as a source parameter to prevent accidental linking and unpredictal Block Transfer behavior.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

360 Channel B Remote I/O Output 1

[ChB RIOA Out 1] — adapter mode

[ChB RIOS Out 1] — scanner mode

ChB RIOx Out 1 contains the second word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	360①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

361 Channel B Remote I/O Output 2

[ChB RIOA Out 2] — adapter mode

[ChB RIOS Out 2] — scanner mode

ChB RIOx Out 2 contains the third word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	361①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

362 Channel B Remote I/O Output 3

[ChB RIOA Out 3] — adapter mode

[ChB RIOS Out 3] — scanner mode

ChB RIOx Out 3 contains the fourth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	362①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

363 Channel B Remote I/O Output 4

[ChB RIOA Out 4] — adapter mode

[ChB RIOS Out 4] — scanner mode

ChB RIOx Out 4 contains the fifth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	363①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

364 Channel B Remote I/O Output 5

[ChB RIOA Out 5] — adapter mode

[ChB RIOS Out 5] — scanner mode

ChB RIOx Out 5 contains the sixth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	364①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

365 Channel B Remote I/O Output 6

[ChB RIOA Out 6] — adapter mode

[ChB RIOS Out 6] — scanner mode

ChB RIOx Out 6 contains the seventh word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	365①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

366 Channel B Remote I/O Output 7

[ChB RIOA Out 7] — adapter mode

[ChB RIOS Out 7] — scanner mode

ChB RIOx Out 7 contains the eighth word or data group to the PLC controller input image table. The data is transferred to the PLC controller every rack scan. The PLC Communications Adapter Board can provide this value directly. Other drive functions can provide this value through a configuration link.

Parameter Number	366①
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	None
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Channel B

① This parameter is not available if you set up channel B for DH+. Availability also depends on the selected rack size.

Note: All eight words are displayed regardless of the rack size. Only the number of words corresponding to the rack size and protocol (with or without block transfer) are functional.

367 Channel A Logic Command Input
[ChA Logic Cmd In]

This logic command parameter is for Channel A. ChA Logic Cmd In is permanently linked to parameter 52, logic command word.

Parameter Number	367
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Bits
Factory Default	0 Hex
Minimum Value	0 Hex
Maximum Value	FFFF Hex
File – Group	Communications I/O – Logic Velocity Torque – Logic

Enums

Bit 0 = Normal Stop	Bit 8 = Coast Stop
Bit 1 = Start	Bit 9 = Vel Ramp Disable
Bit 2 = Jog 1	Bit 10 = Flux Enable
Bit 3 = Clear Fault	Bit 11 = Process Trim
Bit 4 = Forward	Bit 12 = Vel Ref A
Bit 5 = Reverse	Bit 13 = Vel Ref B
Bit 6 = Jog 2	Bit 14 = Vel Ref C
Bit 7 = I Limit Stop	Bit 15 = Reset Drive

C B A	
0 0 0	Zero
0 0 1	External Ref 1 (par 101, 100)
0 1 0	Preset Speed 1 (par 119)
0 1 1	Preset Speed 2 (par 120)
1 0 0	Preset Speed 3 (par 121)
1 0 1	Preset Speed 4 (par 122)
1 1 0	Preset Speed 5 (par 123)
1 1 1	External Ref 2 (par 104, 103)

368 Channel B Logic Command Input
[ChB Logic Cmd In]

This logic command parameter is for Channel B. ChB Logic Cmd In is permanently linked to parameter 52, logic command word.

Parameter Number	368
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Bits
Factory Default	0 Hex
Minimum Value	0 Hex
Maximum Value	FFFF Hex
File – Group	Communications I/O – Logic Velocity Torque – Logic

Enums

Bit 0 = Normal Stop	Bit 8 = Coast Stop
Bit 1 = Start	Bit 9 = Vel Ramp Disable
Bit 2 = Jog 1	Bit 10 = Flux Enable
Bit 3 = Clear Fault	Bit 11 = Process Trim
Bit 4 = Forward	Bit 12 = Vel Ref A
Bit 5 = Reverse	Bit 13 = Vel Ref B
Bit 6 = Jog 2	Bit 14 = Vel Ref C
Bit 7 = I Limit Stop	Bit 15 = Reset Drive

C B A	
0 0 0	Zero
0 0 1	External Ref 1 (par 101, 100)
0 1 0	Preset Speed 1 (par 119)
0 1 1	Preset Speed 2 (par 120)
1 0 0	Preset Speed 3 (par 121)
1 0 1	Preset Speed 4 (par 122)
1 1 0	Preset Speed 5 (par 123)
1 1 1	External Ref 2 (par 104, 103)

369 Stop Owner
[Stop Owner]

Stop Owner displays which ports are presently issuing a valid Stop command.

Parameter Number	369
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners

Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

370 Direction Owner
[Dir Owner]

Dir Owner displays which port currently has exclusive control of direction changes.

Parameter Number	370
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

371 Start Owner
[Start Owner]

Start Owner displays which ports are presently issuing a valid Start command.

Parameter Number	371
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

372 Jog1 Owner
[Jog1 Owner]

Jog1 Owner displays which ports are presently issuing a valid Jog1 command.

Parameter Number	372
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

373 Jog2 Owner
[Jog2 Owner]

Jog2 Owner displays which ports are presently issuing a valid Jog2 command.

Parameter Number	373
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

374 Set Reference Owner
[Set Ref Owner]

Set Ref Owner displays which port currently has exclusive control in selecting the command frequency source.

Parameter Number	374
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

375 Local Owner
[Local Owner]

Local Owner displays which port has requested exclusive control of all drive logic functions. If a port is in local lockout, all other functions (except stop) on all other ports are locked out and are non–functional.

Parameter Number	375
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

376 Flux Owner
[Flux Owner]

Flux Owner displays which ports are presently issuing a valid Flux Enable command.

Parameter Number	376
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

377 Trim Owner
[Trim Owner]

Trim Owner displays which port is presently issuing a Trim Enable command.

Parameter Number	377
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

378 Ramp Owner
[Ramp Owner]

Ramp Owner displays which port is presently issuing a Ramp command.

Parameter Number	378
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

379 Clear Fault Owner
[Clr Fault Owner]

Clr Fault Owner displays which port is presently issuing a Clear Fault command.

Parameter Number	379
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	0FE Hex
File – Group	Communications I/O – SCANport Owners
Enums	Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

386 SCANport Analog Output
[SP Analog Out]

SP Analog Out passes the value it contains to the attached SCANport devices. For example, you can link one of the output parameters to SP Analog Out and each of the five SCANport devices could read the value of the output parameter.

Parameter Number	386
Parameter Type	Read/Write, Sink
Display Units / Drive Units	±32767
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communications I/O – Analog Output

387 Analog Output 1
[Analog Out 1]

Analog Out 1 converts a ±32767 value to a ±10V signal. The digital value is linked to a 1336 FORCE source parameter which provides a value that is scaled and offset. The results are converted to a voltage signal, where ±2048 results in a ±10V output.

Parameter Number	387
Parameter Type	Read/Write, Sink
Display Units / Drive Units	±32767
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communication I/O – Analog Output

388 Analog Output 2
[Analog Out 2]

Analog Out 2 converts a ±32767 value to a ±10V signal. The digital value is linked to a 1336 FORCE source parameter which provides a value that is scaled and offset. The results are converted to a voltage signal, where ±2048 results in a ±10V output.

Parameter Number	388
Parameter Type	Read/Write, Sink
Display Units / Drive Units	±32767
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communication I/O – Analog Output

389 Analog Output 3
[Analog Out 3]

Analog Out 3 converts a ±32767 value to a ±10V signal. The digital value is linked to a 1336 FORCE source parameter which provides a value that is scaled and offset. The results are converted to a voltage signal, where ±2048 results in a ±10V output.

Parameter Number	389
Parameter Type	Read/Write, Sink
Display Units / Drive Units	±32767
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communication I/O – Analog Output

390 Analog Output 4
[Analog Out 4]

Analog Out 4 converts a ±32767 value to a ±10V signal. The digital value is linked to a 1336 FORCE source parameter which provides a value that is scaled and offset. The results are converted to a voltage signal, where ±2048 results in a ±10V output.

Parameter Number	390
Parameter Type	Read/Write, Sink
Display Units / Drive Units	±32767
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Communication I/O – Analog Output

391 SCANport Analog Select
[SP Analog Sel]

SP Analog Sel indicates which port (1 through 5) is to receive the SCANport analog input value that appears in parameter 338, SP Analog In.

Parameter Number	391
Parameter Type	Read/Write, Sink
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	5
File – Group	Communications I/O – Analog Output
Enums	1 = Port 1, 2 = Port 2, 3 = Port 3, 4 = Port 4, 5 = Port 5

392 Analog Input 1 Offset
[Analog In 1 Offset]

Analog In 1 Offset determines the offset applied to the raw Analog In 1 values before the scale factor is applied. This allows you to shift the range of the analog input.

Parameter Number	392
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Input

393 Analog Input 1 Scale
[Analog In 1 Scale]

Analog In 1 Scale determines the scale factor or gain for the Analog In 1 value. A +10V dc signal applied to Analog In 1 at TB21 is converted to a +2048 digital value used by the 1336 FORCE. Before the digital value is displayed or transferred to the drive, the scale factor is applied allowing an effective digital range of ±32767 (16 x 2048). The absolute digital value is clamped at 32767.

Scale Factor	Drive Units
1	2048
2	4096
4	8192
16	32767

Parameter Number	393
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±32767
Factory Default	+1
Minimum Value	–16
Maximum Value	+16
File – Group	Communications I/O – Analog Input

394 Analog Input 2 Offset
[Analog In 2 Offset]

Analog In 2 Offset determines the offset applied to the raw Analog In 2 values before the scale factor is applied. This allows you to shift the range of the analog input.

Parameter Number	394
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Input

395 Analog Input 2 Scale
[Analog In 2 Scale]

Analog In 2 Scale determines the scale factor or gain for the Analog In 2 value. A +10V dc signal applied to Analog In 2 at TB21 is converted to a +2048 digital value used by the 1336 FORCE. Before the digital value is displayed or transferred to the drive, the scale factor is applied allowing an effective digital range of ±32767 (16 x 2048). The absolute digital value is clamped at 32767.

Scale Factor	Drive Units
1	2048
2	4096
4	8192
16	32767

Parameter Number	395
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±32767
Factory Default	+1
Minimum Value	–16
Maximum Value	+16
File – Group	Communications I/O – Analog Input

396 Analog Input 3 Offset
[Analog In 3 Offset]

Analog In 3 Offset determines the offset applied to the raw Analog In 3 values before the scale factor is applied. This allows you to shift the range of the analog input.

Parameter Number	396
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Input

397 Analog Input 3 Scale
[Analog In 3 Scale]

Analog In 3 Scale determines the scale factor or gain for the Analog In 3 value. A +10V dc signal applied to Analog In 3 at TB21 is converted to a +2048 digital value used by the 1336 FORCE. Before the digital value is displayed or transferred to the drive, the scale factor is applied allowing an effective digital range of ±32767 (16 x 2048). The absolute digital value is clamped at 32767.

Scale Factor	Drive Units
1	2048
2	4096
4	8192
16	32767

Parameter Number	397
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±32767
Factory Default	+1
Minimum Value	–16
Maximum Value	+16
File – Group	Communications I/O – Analog Input

398 Analog Input 4 Offset
[Analog In 4 Offset]

Analog In 4 Offset determines the offset applied to the raw Analog In 4 values before the scale factor is applied. This allows you to shift the range of the analog input.

Parameter Number	398
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Input

399 Analog Input 4 Scale
[Analog In 4 Scale]

Analog In 4 Scale determines the scale factor or gain for the Analog In 4 value. A +10V dc signal applied to Analog In 4 at TB21 is converted to a +2048 digital value used by the 1336 FORCE. Before the digital value is displayed or transferred to the drive, the scale factor is applied allowing an effective digital range of ±32767 (16 x 2048). The absolute digital value is clamped at 32767.

Scale Factor	Drive Units
1	2048
2	4096
4	8192
16	32767

Parameter Number	399
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±32767
Factory Default	+1
Minimum Value	–16
Maximum Value	+16
File – Group	Communications I/O – Analog Input

400 Analog Output 1 Offset
[Analog Out 1 Offset]

Analog Out 1 Offset determines the offset applied to the Analog Out 1 value after the scale factor is applied. This allows you to shift the range of the analog output.

Parameter Number	400
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Output

401 Analog Output 1 Scale
[Analog Out 1 Scale]

Analog Out 1 Scale determines the scale factor or gain for the Analog In 1 value. A +2048 value corresponds to a +10V output signal at TB21. The value sent (linked) to Analog Out 1 is scaled by the corresponding scale parameter before it is offset and converted to an analog signal.

Scale Factor	Drive Units
1	32767
1/2	16383
1/4	8192
1/16	2048

Parameter Number	401
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±32767
Factory Default	+1
Minimum Value	–1
Maximum Value	+1
File – Group	Communication I/O – Analog Output

402 Analog Output 2 Offset
[Analog Out 2 Offset]

Analog Out 2 Offset determines the offset applied to the Analog Out 2 value after the scale factor is applied. This allows you to shift the range of the analog output.

Parameter Number	402
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	±4096
Factory Default	0
Minimum Value	–20 Volts
Maximum Value	+20 Volts
File – Group	Communications I/O – Analog Output

403 Analog Output 2 Scale
[Analog Out 2 Scale]

Analog Out 2 Scale determines the scale factor or gain for the Analog In 2 value. A +2048 value corresponds to a +10V output signal at TB21. The value sent (linked) to Analog Out 2 is scaled by the corresponding scale parameter before it is offset and converted to an analog signal.

Scale Factor	Drive Units
1	32767
1/2	16383
1/4	8192
1/16	2048

Parameter Number 403
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units ±32767
Factory Default +1
Minimum Value –1
Maximum Value +1
File – Group Communication I/O – Analog Output

404 Analog Output 3 Offset
[Analog Out 3 Offset]

Analog Out 3 Offset determines the offset applied to the Analog Out 3 value after the scale factor is applied. This allows you to shift the range of the analog output.

Parameter Number 404
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units ±4096
Factory Default 0
Minimum Value –20 Volts
Maximum Value +20 Volts
File – Group Communications I/O – Analog Output

405 Analog Output 3 Scale
[Analog Out 3 Scale]

Analog Out 3 Scale determines the scale factor or gain for the Analog In 3 value. A +2048 value corresponds to a +10V output signal at TB21. The value sent (linked) to Analog Out 3 is scaled by the corresponding scale parameter before it is offset and converted to an analog signal.

Scale Factor	Drive Units
1	32767
1/2	16383
1/4	8192
1/16	2048

Parameter Number 405
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units ±32767
Factory Default +1
Minimum Value –1
Maximum Value +1
File – Group Communication I/O – Analog Output

406 Analog Output 4 Offset
[Analog Out 4 Offset]

Analog Out 4 Offset determines the offset applied to the Analog Out 4 value after the scale factor is applied. This allows you to shift the range of the analog output.

Parameter Number 406
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units ±4096
Factory Default 0
Minimum Value –20 Volts
Maximum Value +20 Volts
File – Group Communications I/O – Analog Output

407 Analog Output 4 Scale
[Analog Out 4 Scale]

Analog Out 4 Scale determines the scale factor or gain for the Analog In 4 value. A +2048 value corresponds to a +10V output signal at TB21. The value sent (linked) to Analog Out 4 is scaled by the corresponding scale parameter before it is offset and converted to an analog signal.

Scale Factor	Drive Units
1	32767
1/2	16383
1/4	8192
1/16	2048

Parameter Number 407
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units ±32767
Factory Default +1
Minimum Value –1
Maximum Value +1
File – Group Communication I/O – Analog Output

408 Port Enable
[Port Enable]

Port Enable indicates which ports can accept commands listed in parameters 409 through 415.

Parameter Number 408
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

409 Direction Mask
[Dir Mask]

Dir Mask controls which ports can issue forward/reverse commands.

Parameter Number 409
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

410 Start Mask
[Start Mask]

Start Mask controls which ports can issue a start command.

Parameter Number 410
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

411 Jog Mask
[Jog Mask]

Jog Mask controls which ports can issue a jog command.

Parameter Number 411
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

412 Reference Mask
[Ref Mask]

Ref Mask controls which ports can select an alternate reference or preset speed.

Parameter Number 412
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communication I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

413 Clear Fault Mask
[Clr Fault Mask]

Clr Fault Mask controls which ports can generate a clear fault command.

Parameter Number 413
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

414 Reset Drive Mask
[Reset Drive Mask]

Reset Drive Mask controls which ports can reset a fault.

Parameter Number 414
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communication I/O – SCANport Masks
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

415 Local Mask
[Local Mask]

Local Mask controls which ports are allowed to take exclusive control of drive logic commands except Stop. (Stop is accepted from any device regardless of who has control.) You can only take exclusive local control while the drive is stopped.

Parameter Number 415
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 0
Minimum Value 0
Maximum Value 0FE Hex
File – Group Communications I/O – SCANport Owners
Enums Bit 1 = Port 1, Bit 2 = Port 2, Bit 3 = Port 3, Bit 4 = Port 4, Bit 5 = Port 5, Bit 6 = Channel A, Bit 7 = Channel B

416 SCANport Default Reference
[SP Default Ref]

SP Default Ref defines the default reference to be used when the drive is powered up. You can change the value of this parameter, but the change is only accessed when the drive is powered up.

Parameter Number	416			
Parameter Type	Read/Write, Non–Linkable Sink			
Display Units / Drive Units	None			
Factory Default	2			
Minimum Value	1			
Maximum Value	7			
File – Group	Velocity Torque – Velocity Ref			
Enums	Bit 1 = Xref1	Bit 2 = Preset1	Bit 3 = Preset2	Bit 4 = Preset3
	Bit 5 = Preset4	Bit 6 = Preset5	Bit 7 = Xref2	

425 Channel A Remote I/O Fault Select

[ChA RIOA Flt Sel] — adapter mode

[ChA RIOS Flt Sel] — scanner mode

ChA RIOx Flt Sel dictates whether the PLC Communications Adapter Board will report a fault condition if a PLC controller RIO communications fault occurs at channel A.

If a bit is zero, parameter 426 is checked to see whether a warning condition should be reported.

ChA RIOx Flt Sel is not used if channel A is set up for DH+ communications.

Parameter Number 425
Parameter Type Read/Write, Non–Linkable Sink
Display Units / Drive Units Bits
Factory Default 15
Minimum Value 0
Maximum Value 15 (adapter) or 255 (scanner)
File – Group Diagnostics – Fault Select/Status
Communication I/O – Fault Select/Status

When RIO adapter is used:

Enums

Bits 7–4 Bit 3 Bit 2 Bit 1 Bit 0

- Bit 0: Res/Pgm/Test (Flt 36023)
  0 = No drive soft fault
  1 = Drive soft fault
- Bit 1: Comm Loss (Flt 36021)
  0 = No drive soft fault
  1 = Drive soft fault
- Bit 2: Last State
  0 = Data zeroed
  1 = Last state
- Bit 3: Rack Inhibit (Flt 36025)
  0 = No drive soft fault
  1 = Drive soft fault
- Bits 7–4: Not used

When RIO scanner is used:

Enums

Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 Bit 0

- Bit 0: Rck Flt Grp 0
  0 = No rack fault
  1 = Rack fault
- Bit 1: Rck Flt Grp 2
  0 = No rack fault
  1 = Rack fault
- Bit 2: Rck Flt Grp 4
  0 = No rack fault
  1 = Rack fault
- Bit 3: Rck Flt Grp 6
  0 = No rack fault
  1 = Rack fault
- Bit 4: Inhibit Grp 0
  0 = Group 0 not inhibited
  1 = Inhibit group 0
- Bit 5: Inhibit Grp 2
  0 = Group 2 not inhibited
  1 = Inhibit group 2
- Bit 6: Inhibit Grp 4
  0 = Group 4 not inhibited
  1 = Inhibit group 4
- Bit 7: Inhibit Grp 6
  0 = Group 6 not inhibited
  1 = Inhibit group 6

426 Channel A Remote I/O Warning Select

[ChA RIOA Warn Sel] — adapter mode

[ChA RIOS Warn Sel] — scanner mode

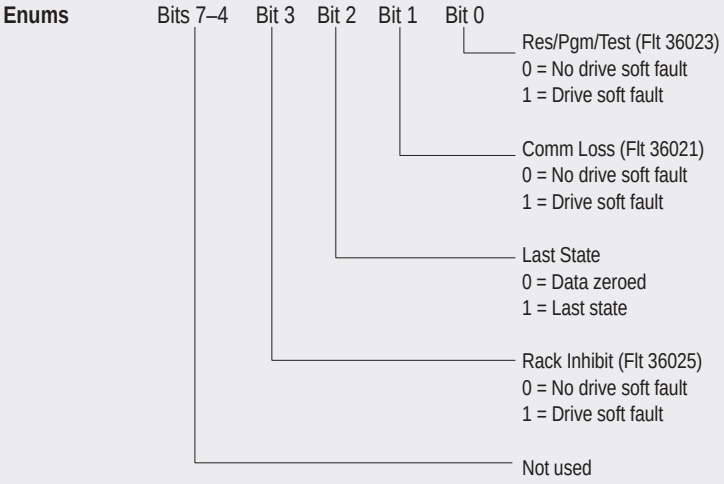
ChA RIOx Warn Sel dictates whether the PLC Communications Adapter Board will report a warning condition if a PLC controller RIO communications fault occurs at channel A.

ChA RIOx Warn Sel is not used if channel A is set up for DH+ communications.

Parameter Number	426
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Bits
Factory Default	15
Minimum Value	0
Maximum Value	15 (adapter) or 255 (scanner)
File – Group	Diagnostics – Fault Select/Status Communications I/O – Fault Select/Status

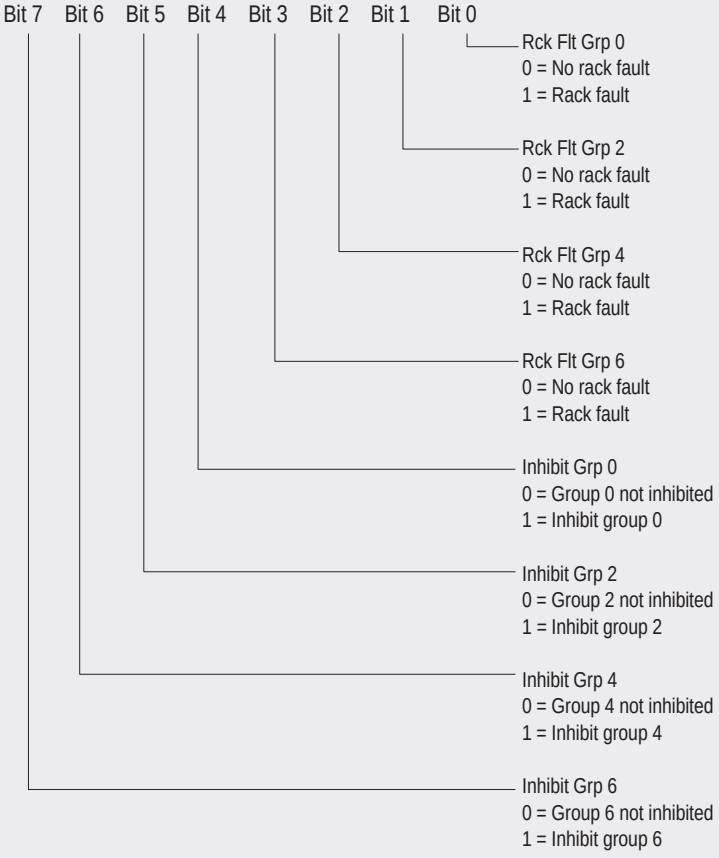
When RIO adapter is used:

Enums



When RIO scanner is used:

Enums



427 Redundant Channel Number

[Redund Chan No]

(When Redundant RIO Is Used)

Redund Chan No determines which channel number the 1336 FORCE will use for control purposes. Input image data and messages from the selected channel are passed to the drive, while input image data from the other channel are discarded. Messages from the other channel are still accepted if the other channel is configured for RIO adapter mode with block transfer. Output image data is sent to both channels.

The choices are 0 for channel A and 1 for channel B. This is only active when both channels are set up for RIO and the redundant mode is selected on the DIP switches. Images from the 1336 FORCE will go to both PLCs regardless of the parameter setting.

Parameter Number	427
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Communication I/O – Channel A
Enums	0 = Channel A 1 = Channel B

Channel A RIO Scanner Retries

[ChA RIOS Retries]

(When RIO Scanner Is Used)

ChA RIOS Retries counts the number of communication retries for all entries in the scan list. This is only active when RIO scanner mode is selected on the DIP switches.

Parameter Type	Read, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535
File – Group	Communication I/O – Channel A

430 Channel B Remote I/O Fault Select

[ChB RIOA Flt Sel] — adapter mode

[ChB RIOS Flt Sel] — scanner mode

ChB RIOx Flt Sel dictates whether the PLC Communications Adapter Board will report a fault condition if a PLC controller RIO communications fault occurs at channel B.

If a bit is zero, parameter 426 is checked to see whether a warning condition should be reported.

ChB RIOx Flt Sel is not used if channel B is set up for DH+ communications.

Parameter Number	430
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Bits
Factory Default	15
Minimum Value	0
Maximum Value	15 (adapter) or 255 (scanner)
File – Group	Diagnostics – Fault Select/Status Communication I/O – Fault Select/Status

When RIO adapter is used:

Enums

Bits 7–4 Bit 3 Bit 2 Bit 1 Bit 0

- Bit 0: Res/Pgm/Test (Flt 36024)
  - 0 = No drive soft fault
  - 1 = Drive soft fault
- Bit 1: Comm Loss (Flt 36022)
  - 0 = No drive soft fault
  - 1 = Drive soft fault
- Bit 2: Last State
  - 0 = Data zeroed
  - 1 = Last state
- Bit 3: Rack Inhibit (Flt 36025)
  - 0 = No drive soft fault
  - 1 = Drive soft fault
- Bits 7–4: Not used

When RIO scanner is used:

Enums

Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 Bit 0

- Bit 0: Rck Flt Grp 0
  - 0 = No rack fault
  - 1 = Rack fault
- Bit 1: Rck Flt Grp 2
  - 0 = No rack fault
  - 1 = Rack fault
- Bit 2: Rck Flt Grp 4
  - 0 = No rack fault
  - 1 = Rack fault
- Bit 3: Rck Flt Grp 6
  - 0 = No rack fault
  - 1 = Rack fault
- Bit 4: Inhibit Grp 0
  - 0 = Group 0 not inhibited
  - 1 = Inhibit group 0
- Bit 5: Inhibit Grp 2
  - 0 = Group 2 not inhibited
  - 1 = Inhibit group 2
- Bit 6: Inhibit Grp 4
  - 0 = Group 4 not inhibited
  - 1 = Inhibit group 4
- Bit 7: Inhibit Grp 6
  - 0 = Group 6 not inhibited
  - 1 = Inhibit group 6

431 Channel B Remote I/O Warning Select

[ChB RIOA Warn Sel] — adapter mode

[ChB RIOS Warn Sel] — scanner mode

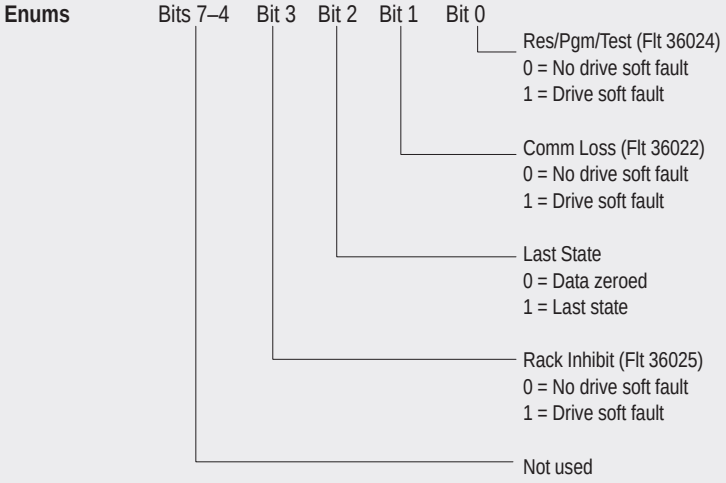
ChB RIOx Warn Sel dictates whether the PLC Communications Adapter Board will report a warning condition or no action if a PLC controller RIO communications fault occurs at channel B.

ChB RIOx Warn Sel is not used if channel B is set up for DH+ communications.

Parameter Number	431
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Bits
Factory Default	15
Minimum Value	0
Maximum Value	15 (adapter) or 255 (scanner)
File – Group	Diagnostics – Fault Select/Status Communications I/O – Fault Select/Status

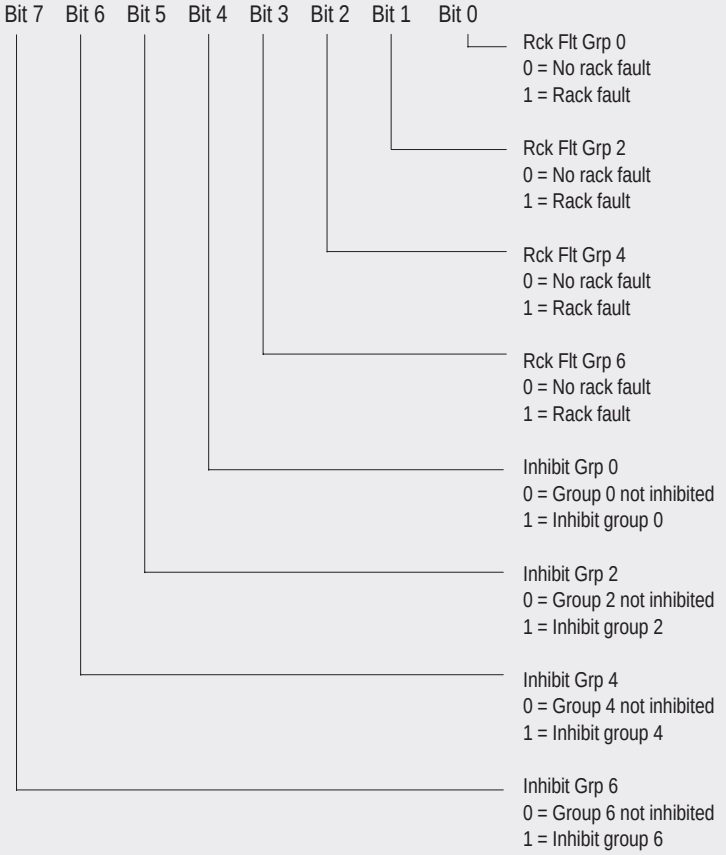
When RIO adapter is used:

Enums



When RIO scanner is used:

Enums



432 Channel B RIO Scanner Retries
[ChB RIOS Retries]

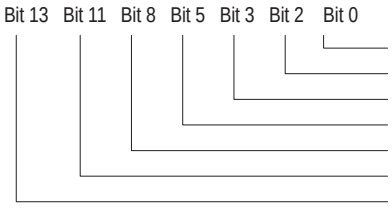
ChB RIOS Retries counts the number of communication retries for all entries in the scan list. This is only active when RIO scanner mode is selected for channel B on the DIP switches.

Parameter Number	432
Parameter Type	Read, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	65535
File – Group	Communication I/O – Channel B

435 DIP Fault Setup
[DIP Fault Setup]

DIP Fault Setup indicates which DIP switch faults the PLC Communications Adapter Board has encountered.

Parameter Number	435
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0000 0000 0000 0000
Minimum Value	0000 0000 0000 0000
Maximum Value	1111 1111 1111 1111
File – Group	Diagnostics – Info



Enums	Fault
ChA Rack Set	ChA Rack Config (Flt 34006)
ChA Redundnt	Redund Diff Prot (Flt 34015)
ChA Mod Grp	ChA Module Group (Flt 34012)
ChA Dup Node	ChA Dup Nodeaddr (Flt 36019)
ChB Rack Set	ChB Rack Config (Flt 34007)
ChB Mod Grp	ChB Module Group (Flt 34013)
ChB Dup Node	ChB Dup Nodeaddr (Flt 36020)

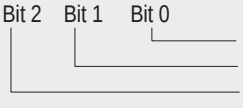
Bits 1, 4, 6, 7, 9, 10, and 12 are not used.

436 Channel A Fault Status
[ChA Fault Sts]

ChA Fault Sts lists the current fault conditions at channel A of the PLC Communications Adapter Board. This is only present if channel A is defined to be either RIO adapter or RIO scanner.

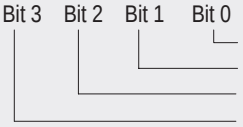
Parameter Number	436
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	7 (adapter) or 15 (scanner)
File – Group	Diagnostics – Fault Select/Status Communications I/O – Fault Select/Status

When RIO adapter is used:



Enums	Fault
Res/Pgm/Test	ChA Res/Pgm/Test (Flt 36023)
Comm Loss	ChA Comm Loss (Flt 36021)
Rack Inhibit	Rack Inhibit (Flt 36025)

When RIO scanner is used:



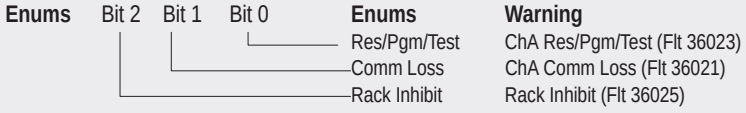
Enums	Fault
Rck Flt Grp0	ChA G0 Rack Flt (Flt 36027)
Rck Flt Grp2	ChA G2 Rack Flt (Flt 36028)
Rck Flt Grp4	ChA G4 Rack Flt (Flt 36029)
Rck Flt Grp6	ChA G6 Rack Flt (Flt 36030)

437 Channel A Warning Status
[ChA Warn Sts]

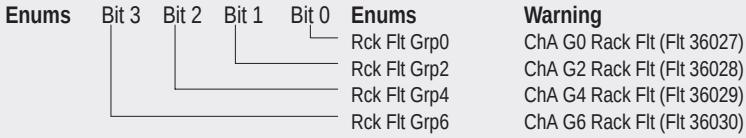
ChA Warn Sts lists the current warning conditions at channel A of the PLC Communications Adapter Board. This is only present if channel A is defined to be either RIO adapter or RIO scanner.

Parameter Number	437
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	7 (adapter) or 15 (scanner)
File – Group	Diagnostics – Fault Select/Status Communications I/O – Fault Select/Status

When RIO adapter is used:



When RIO scanner is used:

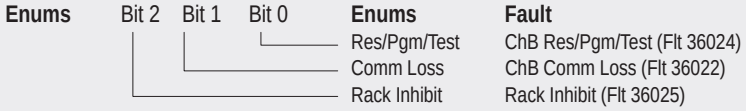


438 Channel B Fault Status
[ChB Fault Sts]

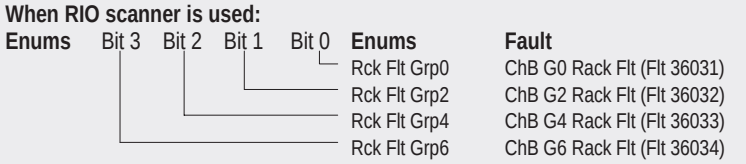
ChB Fault Sts lists the current fault conditions at channel B of the PLC Communications Adapter Board. This is only present if channel B is defined to be either RIO adapter or RIO scanner.

Parameter Number	438
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	7 (adapter) or 15 (scanner)
File – Group	Diagnostics – Fault Select/Status Communications I/O – Fault Select/Status

When RIO adapter is used:



When RIO scanner is used:

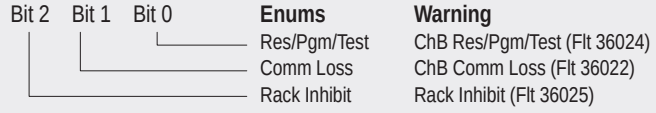


439 Channel B Warning Status
[ChB Warn Sts]

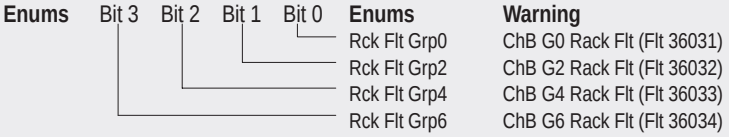
ChB Warn Sts lists the current warning conditions at channel B of the PLC Communications Adapter Board. This is only present if channel B is defined to be either RIO adapter or RIO scanner.

Parameter Number	439
Parameter Type	Read Only, Source
Display Units / Drive Units	Bits
Factory Default	0
Minimum Value	0
Maximum Value	7 (adapter) or 15 (scanner)
File – Group	Diagnostics – Fault Select/Status
	Communications I/O – Fault Select/Status

When RIO adapter is used:



When RIO scanner is used:

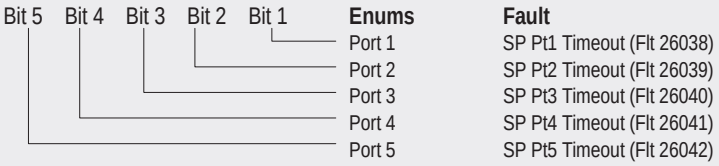


440 SCANport Fault Selection
[SP Fault Sel]

SP Fault Sel indicates which ports will cause a drive soft fault on loss of communications.

Parameter Number	440	
Parameter Type	Read Only, Source	
Display Units / Drive Units	Bits	
Factory Default	0011	1110
Minimum Value	0000	0000
Maximum Value	0011	1110
File – Group	Diagnostics – Fault Select/Status	
	Communications I/O – Fault Select/Status	

Enums

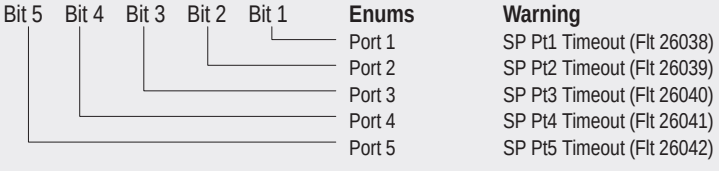


441 SCANport Warning Selection
[SP Warn Sel]

SP Warn Sel indicates which ports will cause a drive warning on loss of communications.

Parameter Number	441	
Parameter Type	Read Only, Source	
Display Units / Drive Units	Bits	
Factory Default	0011	1110
Minimum Value	0000	0000
Maximum Value	0011	1110
File – Group	Diagnostics – Fault Select/Status	
	Communications I/O – Fault Select/Status	

Enums

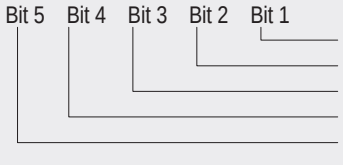


442 SCANport Fault Status
[SP Fault Sts]

SP Fault Sts indicates which communications soft faults the drive has encountered at the ports.

Parameter Number	442	
Parameter Type	Read Only, Source	
Display Units / Drive Units	Bits	
Factory Default	0011	1110
Minimum Value	0000	0000
Maximum Value	0011	1110
File – Group	Diagnostics – Fault Select/Status	
	Communications I/O – Fault Select/Status	

Enums



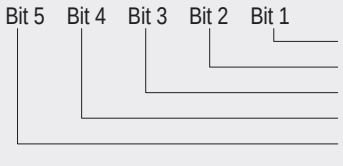
Enums	Fault
Port 1	SP Pt1 Timeout (Flt 26038)
Port 2	SP Pt2 Timeout (Flt 26039)
Port 3	SP Pt3 Timeout (Flt 26040)
Port 4	SP Pt4 Timeout (Flt 26041)
Port 5	SP Pt5 Timeout (Flt 26042)

443 SCANport Warning Status
[SP Warn Sts]

SP Warn Sts indicates which communications warnings the drive has encountered at the ports.

Parameter Number	443	
Parameter Type	Read Only, Source	
Display Units / Drive Units	Bits	
Factory Default	0011	1110
Minimum Value	0000	0000
Maximum Value	0011	1110
File – Group	Diagnostics – Fault Select/Status	
	Communications I/O – Fault Select/Status	

Enums



Enums	Warning
Port 1	SP Pt1 Timeout (Flt 26038)
Port 2	SP Pt2 Timeout (Flt 26039)
Port 3	SP Pt3 Timeout (Flt 26040)
Port 4	SP Pt4 Timeout (Flt 26041)
Port 5	SP Pt5 Timeout (Flt 26042)

454 Trend Input 1
[Trend In 1]

Trend In 1 specifies the data value to sample at the specified trend sample rate. You should link Trend In 1 to a source parameter (such as velocity, torque, or current) for the trend to make sense.

Parameter Number	454
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend I/O

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Trend In 1's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

455 Trend 1 Operand Parameter X
[Tr1 Opnd Parm X]

Tr1 Opnd Parm X specifies the first of two parameter numbers for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	455
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr1 Opnd Parm X's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

456 Trend 1 Operand Parameter Y
[Tr1 Opnd Parm Y]

Tr1 Opnd Parm Y specifies the second of two parameter numbers used for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	456
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr1 Opnd Parm Y's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

457 Trend 1 Operator
[Tr1 Operator]

Tr 1 Operator specifies the operator used for the trend trigger evaluation. The available operators are:

Value	Description	
1	Greater Than	(.GT.)
2	Less Than	(.LT.)
3	Equals	(.EQ.)
4	Not Equals	(.NE.)
5	Logical AND	(.AND.)
6	Logical NAND	(.NAND.)
7	Logical OR	(.OR.)
8	Logical NOR	(.NOR.)

Parameter Number	457
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	5
Minimum Value	1
Maximum Value	8
File – Group	Diagnostics – Trend Setup

458 Trend 1 Sample Rate
[Tr1 Sample Rate]

Tr1 Sample Rate specifies the interval at which the data in the Trend In 1 parameter is sampled. It is programmable in 2 millisecond increments. All values are rounded down to the nearest 2 millisecond interval.

Parameter Number	458
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Seconds
Factory Default	0.020 Seconds
Minimum Value	0.002 Seconds
Maximum Value	30 Seconds
File – Group	Diagnostics – Trend Setup

459 Trend 1 Post Samples
[Tr1 Post Samples]

Tr1 Post Samples specifies the number of data samples to be gathered once the trigger evaluation becomes true. There is always a sample reserved for the instance when the trigger condition becomes true.

Parameter Number	459
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	15
Minimum Value	0
Maximum Value	499
File – Group	Diagnostics – Trend Setup

460 Trend 1 Continuous Trigger
[Tr1 Cont Trigger]

Tr1 Cont Trigger specifies the type of trend. You can choose either 0 for one–shot or 1 for continuous.

With a one–shot trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend stops.

With a continuous trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend continues looking for the next occurrence of a true trigger condition.

Parameter Number	460
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Diagnostics – Trend Setup

461 Trend 1 Select
[Tr1 Select]

Tr1 Select specifies the trend mode. The states are as follows:

0 Disable the trend.
1 Enable the trend.
2 Force a true trigger condition.

Parameter Number	461
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2
File – Group	Diagnostics – Trend Setup
Enums	0 = Disable 1 = Enable 2 = Force Trig

462 Trend 1 Status
[Tr1 Status]

Tr1 Status identifies which state the trend is currently in. The following states are possible:

1	Stopped	Trending is not executing.
2	Running	Trending is executing, but the trigger point has not yet been reached.
3	Tripped/Trigger	Trending is executing, and the trigger point has been reached.
4	Tripped/Forced	The trigger point was forced.

Parameter Number	462
Parameter Type	Read Only, Non–Linkable Source
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	4
File – Group	Diagnostics – Trend I/O
Enums	1 = Stopped 2 = Running 3 = Trip Trig 4 = Force Trip

463 Trend Output 1
[Trend Out 1]

Trend Out 1 displays the latest 500 trend input data values once the trigger condition is true and all post samples are gathered. This parameter is updated at the same rate as the data was sampled. This parameter can be linked to Analog Output (for example) and a chart recorder connected to Analog Output to provide a hard copy of the trend data.

Parameter Number	463
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Diagnostics – Trend I/O

464 Trend Input 2
[Trend In 2]

Trend In 2 specifies the data value to sample at the specified trend sample rate. You should link Trend In 2 to a source parameter (such as velocity, torque, or current) for the trend to make sense.

Parameter Number	464
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend I/O

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Trend In 2's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

465 Trend 2 Operand Parameter X
[Tr2 Opnd Parm X]

Tr2 Opnd Parm X specifies the first of two parameter numbers for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	465
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr2 Opnd Parm X's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

466 Trend 2 Operand Parameter Y
[Tr2 Opnd Parm Y]

Tr2 Opnd Parm Y specifies the second of two parameter numbers used for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	466
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr2 Opnd Parm Y's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

467 Trend 2 Operator
[Tr2 Operator]

Tr2 Operator specifies the operator used for the trend trigger evaluation. The available operators are:

Value	Description	
1	Greater Than	(.GT.)
2	Less Than	(.LT.)
3	Equals	(.EQ.)
4	Not Equals	(.NE.)
5	Logical AND	(.AND.)
6	Logical NAND	(.NAND.)
7	Logical OR	(.OR.)
8	Logical NOR	(.NOR.)

Parameter Number	467
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	5
Minimum Value	1
Maximum Value	8
File – Group	Diagnostics – Trend Setup

468 Trend 2 Sample Rate
[Tr2 Sample Rate]

Trend 2 Sample Rate specifies the interval at which the data in the Trend In 2 parameter is sampled. It is programmable in 2 millisecond increments. All values are rounded down to the nearest 2 millisecond interval.

Parameter Number	468
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Seconds
Factory Default	0.020 Seconds
Minimum Value	0.002 Seconds
Maximum Value	30 Seconds
File – Group	Diagnostics – Trend Setup

469 Trend 2 Post Samples
[Tr2 Post Samples]

Tr2 Post Samples specifies the number of data samples to be gathered once the trigger evaluation becomes true. There is always a sample reserved for the instance when the trigger condition becomes true.

Parameter Number	469
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	15
Minimum Value	0
Maximum Value	499
File – Group	Diagnostics – Trend Setup

470 Trend 2 Continuous Trigger
[Tr2 Cont Trigger]

Tr2 Cont Trigger specifies the type of trend. You can choose either 0 for one–shot or for continuous.

With a one–shot trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend stops.

With a continuous trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend continues looking for the next occurrence of a true trigger condition.

Parameter Number	470
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Diagnostics – Trend Setup

471 Trend 2 Select
[Tr2 Select]

Tr2 Select specifies the trend mode. The states are as follows:

0 Disable the trend.
1 Enable the trend.
2 Force a true trigger condition.

Parameter Number	471
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2
File – Group	Diagnostics – Trend Setup
Enums	0 = Disable 1 = Enable 2 = Force Trig

472 Trend 2 Status
[Tr2 Status]

Tr2 Status identifies which state the trend is currently in. The following states are possible:

1	Stopped	Trending is not executing.
2	Running	Trending is executing, but the trigger point has not yet been reached.
3	Tripped/Trigger	Trending is executing, and the trigger point has been reached.
4	Tripped/Forced	The trigger point was forced.

Parameter Number	472
Parameter Type	Read Only, Non–Linkable Source
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	4
File – Group	Diagnostics – Trend I/O
Enums	1 = Stopped 2 = Running 3 = Trip Trig 4 = Force Trip

473 Trend Output 2
[Trend Out 2]

Trend Out 2 displays the latest 500 trend input data values once the trigger condition is true and all post samples are gathered. This parameter is updated at the same rate as the data was sampled. This parameter can be linked to Analog Output (for example) and a chart recorder connected to Analog Output to provide a hard copy of the trend data.

Parameter Number	473
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Diagnostics – Trend I/O

474 Trend Input 3
[Trend In 3]

Trend In 3 specifies the data value to sample at the specified trend sample rate. You should link Trend In 3 to a source parameter (such as velocity, torque, or current) for the trend to make sense.

Parameter Number	474
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend I/O

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Trend In 3's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

475 Trend 3 Operand Parameter X
[Tr3 Opnd Parm X]

Tr3 Opnd Parm X specifies the first of two parameter numbers for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	475
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr3 Opnd Parm X's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

476 Trend 3 Operand Parameter Y
[Tr3 Opnd Parm Y]

Tr3 Opnd Parm Y specifies the second of two parameter numbers used for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	476
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr3 Opnd Parm Y's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

477 Trend 3 Operator
[Tr3 Operator]

Tr3 Operator specifies the operator used for the trend trigger evaluation. The available operators are:

Value	Description	
1	Greater Than	(.GT.)
2	Less Than	(.LT.)
3	Equals	(.EQ.)
4	Not Equals	(.NE.)
5	Logical AND	(.AND.)
6	Logical NAND	(.NAND.)
7	Logical OR	(.OR.)
8	Logical NOR	(.NOR.)

Parameter Number	477
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	5
Minimum Value	1
Maximum Value	8
File – Group	Diagnostics – Trend Setup

478 Trend 3 Sample Rate
[Tr3 Sample Rate]

Tr3 Sample Rate specifies the interval at which the data in the Trend In 3 parameter is sampled. It is programmable in 2 millisecond increments. All values are rounded down to the nearest 2 millisecond interval.

Parameter Number	478
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Seconds
Factory Default	0.020 Seconds
Minimum Value	0.002 Seconds
Maximum Value	30 Seconds
File – Group	Diagnostics – Trend Setup

479 Trend 3 Post Samples
[Tr3 Post Samples]

Tr3 Post Samples specifies the number of data samples to be gathered once the trigger evaluation becomes true. There is always a sample reserved for the instance when the trigger condition becomes true.

Parameter Number	479
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	15
Minimum Value	0
Maximum Value	499
File – Group	Diagnostics – Trend Setup

480 Trend 3 Continuous Trigger
[Tr3 Cont Trigger]

Tr3 Cont Trigger specifies the type of trend. You can choose either 0 for one–shot or 1 for continuous.

With a one–shot trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend stops.

With a continuous trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend continues looking for the next occurrence of a true trigger condition.

Parameter Number	480
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Diagnostics – Trend Setup

481 Trend 3 Select
[Tr3 Select]

Tr3 Select specifies the trend mode. The states are as follows:

0 Disable the trend.
1 Enable the trend.
2 Force a true trigger condition.

Parameter Number	481
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2
File – Group	Diagnostics – Trend Setup
Enums	0 = Disable 1 = Enable 2 = Force Trig

482 Trend 3 Status
[Tr3 Status]

Tr3 Status identifies which state the trend is currently in. The following states are possible:

1 Stopped — Trending is not executing.
2 Running — Trending is executing, but the trigger point has not yet been reached.
3 Tripped/Trigger — Trending is executing, and the trigger point has been reached.
4 Tripped/Forced — The trigger point was forced.

Parameter Number	482
Parameter Type	Read Only, Non–Linkable Source
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	4
File – Group	Diagnostics – Trend I/O
Enums	1 = Stopped 2 = Running 3 = Trip Trig 4 = Force Trip

483 Trend Output 3
[Trend Out 3]

Trend Out 3 displays the latest 500 trend input data values once the trigger condition is true and all post samples are gathered. This parameter is updated at the same rate as the data was sampled. This parameter can be linked to Analog Output (for example) and a chart recorder connected to Analog Output to provide a hard copy of the trend data.

Parameter Number	483
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Diagnostics – Trend I/O

484 Trend Input 4
[Trend In 4]

Trend In 4 specifies the data value to sample at the specified trend sample rate. You should link Trend In 4 to a source parameter (such as velocity, torque, or current) for the trend to make sense.

Parameter Number	484
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend I/O

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Trend In 4's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

485 Trend 4 Operand Parameter X
[Tr4 Opnd Parm X]

Tr4 Opnd Parm X specifies the first of two parameter numbers for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	485
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr4 Opnd Parm X's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

486 Trend 4 Operand Parameter Y
[Tr4 Opnd Parm Y]

Tr4 Opnd Parm Y specifies the second of two parameter numbers used for the trend trigger evaluation. The data value for the entered link parameter number is used in the trigger evaluation.

Parameter Number	486
Parameter Type	Read/Write, Sink
Display Units / Drive Units	Dependent on Link①
Factory Default	0
Minimum Value	–32767①
Maximum Value	+32767①
File – Group	Diagnostics – Trend Setup

① These values depend on the source parameter that this parameter is linked to. For example, if the source parameter's drive units are rpm, then Tr4 Opnd Parm Y's drive units will be displayed in rpm. The minimum and maximum values are also link dependent.

487 Trend 4 Operator
[Tr4 Operator]

Tr4 Operator specifies the operator used for the trend trigger evaluation. The available operators are:

Value	Description	
1	Greater Than	(.GT.)
2	Less Than	(.LT.)
3	Equals	(.EQ.)
4	Not Equals	(.NE.)
5	Logical AND	(.AND.)
6	Logical NAND	(.NAND.)
7	Logical OR	(.OR.)
8	Logical NOR	(.NOR.)

Parameter Number	487
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	5
Minimum Value	1
Maximum Value	8
File – Group	Diagnostics – Trend Setup

488 Trend 4 Sample Rate
[Tr4 Sample Rate]

Tr4 Sample Rate specifies the interval at which the data in the Trend In 4 parameter is sampled. It is programmable in 2 millisecond increments. All values are rounded down to the nearest 2 millisecond interval.

Parameter Number	488
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	Seconds
Factory Default	0.020 Seconds
Minimum Value	0.002 Seconds
Maximum Value	30 Seconds
File – Group	Diagnostics – Trend Setup

489 Trend 4 Post Samples
[Tr4 Post Samples]

Tr4 Post Samples specifies the number of data samples to be gathered once the trigger evaluation becomes true. There is always a sample reserved for the instance when the trigger condition becomes true.

Parameter Number	489
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	15
Minimum Value	0
Maximum Value	499
File – Group	Diagnostics – Trend Setup

490 Trend 4 Continuous Trigger
[Tr4 Cont Trigger]

Tr4 Cont Trigger specifies the type of trend. You can choose either 0 for one–shot or 1 for continuous.

With a one–shot trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend stops.

With a continuous trend, once the trigger condition is true and the number of samples after the trigger is taken are gathered, the trend continues looking for the next occurrence of a true trigger condition.

Parameter Number	490
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	1
File – Group	Diagnostics – Trend Setup

491 Trend 4 Select
[Tr4 Select]

Tr4 Select specifies the trend mode. The states are as follows:

0 Disable the trend.
1 Enable the trend.
2 Force a true trigger condition.

Parameter Number	491
Parameter Type	Read/Write, Non–Linkable Sink
Display Units / Drive Units	None
Factory Default	0
Minimum Value	0
Maximum Value	2
File – Group	Diagnostics – Trend Setup
Enums	0 = Disable 1 = Enable 2 = Force Trig

492 Trend 4 Status
[Tr4 Status]

Tr4 Status identifies which state the trend is currently in. The following states are possible:

1	Stopped	Trending is not executing.
2	Running	Trending is executing, but the trigger point has not yet been reached.
3	Tripped/Trigger	Trending is executing, and the trigger point has been reached.
4	Tripped/Forced	The trigger point was forced.

Parameter Number	492
Parameter Type	Read Only, Non–Linkable Source
Display Units / Drive Units	None
Factory Default	1
Minimum Value	1
Maximum Value	4
File – Group	Diagnostics – Trend I/O
Enums	1 = Stopped 2 = Running 3 = Trip Trig 4 = Force Trip

493 Trend Output 4

[Trend Out 4]

Trend Out 4 displays the latest 500 trend input data values once the trigger condition is true and all post samples are gathered. This parameter is updated at the same rate as the data was sampled. This parameter can be linked to Analog Output (for example) and a chart recorder connected to Analog Output to provide a hard copy of the trend data.

Parameter Number	493
Parameter Type	Read Only, Source
Display Units / Drive Units	None
Factory Default	0
Minimum Value	–32767
Maximum Value	+32767
File – Group	Diagnostics – Trend I/O

Block Transfer Services

Chapter Objectives

Chapter 7 provides the following information:

- a description of block transfer
- a description of the block transfer status word
- block transfer message structures

Block Transfer

PLC controllers use discrete transfer to transfer data to and from the PLC Communications Adapter Board during every rack scan. The PLC Communications Adapter Board transfers this data to and from the SCANport device.

PLC controllers use block transfer to transfer data that does not require continuous updates. To perform this function, the PLC Communications Adapter Board provides a status word to the PLC during the normal discrete transfer scan. This status word occupies the first module group in the PLC I/O image table for the designated rack. The PLC program then uses the status word to control the Block Transfer Write (BTW) and Block Transfer Read (BTR) functions of the PLC controller.

The descriptions provided in this chapter contain the configurations necessary to set up the data files in the block transfer instructions. Header and data values depend on the operation to be performed. Also included is a description of the status word that is returned from the drive and appears in the block transfer read header information.

Block Transfer Status Word

In most cases, header word 2 of the drive response contains a negative value (bit 15 = 1) when a block transfer operation is not successful. A status word is also usually returned and indicates the reason for the block transfer failure. The location of the status word is typically header word 4 in the drive response, but will vary depending on the message.

The following status word codes are defined:

This value:	Has the following meaning:
0	No error occurred.
1	The service failed due to an internal reason and the drive could not perform the request. Some messages are read only or write only.
2	The requested service is not supported.
3	An invalid value is in block transfer request header word 2.
4	An invalid value is in block transfer request header word 3.
5	An invalid value is in block transfer request header word 4.
6	The data value is out of range.
7	A drive state conflict occurred. The drive is in an incorrect state to perform the function. The drive cannot be running when certain functions are performed.

The following table summarizes the valid command code that is displayed in word 2 of the block transfer write header message. A complete description of the block transfer write header message is provided on the specified page.

Class:	Function:	PLC Decimal Value:	Page:
Parameter Read	Parameter Value Read	769	7–4
	Continuous Parameter Value Read	1	7–6
	Scattered Parameter Value Read	3	7–8
	Parameter Read Full	768	7–10
Parameter Write	Parameter Value Write	–31999	7–13
	Continuous Parameter Value Write	–32767	7–14
	Scattered Parameter Value Write	–32765	7–16
Fault Queue	Fault Clear/Reset	–30976	7–18
	Trip Fault Queue Number	1793	7–20
	Fault Entry Read Full	1792	7–21
Warning Queue	Warning Clear	–30720	7–23
	Warning Queue Read Full	2048	7–25
EE Memory Request	Save/Recall/Initialize	–31988	7–27
Link Read	Link Parameter Read	2304	7–29
	Continuous Parameter Link Read	4	7–30
	Scattered Parameter Link Read	5	7–32
Link Write	Link Parameter Write	–30464	7–34
	Continuous Parameter Link Write	–32764	7–35
	Scattered Parameter Link Write	–32763	7–37
	Parameter Link Clear	–30464	7–39
User Text String	User Text String Read	261	7–40
	User Text String Write	–32507	7–42
Clock Data	Real Time Clock Data Read	2816	7–44
	Real Time Clock Data Write	2816	7–46
Run Time Accumulator	Run Time Accumulator Data Read	2817	7–48
	Clear Run Time Accumulator	–29950	7–50
Time Stamp	Reference Time Stamp Data Read	2816	7–51
	Reference Time Stamp Data Write	–29952	7–53
	Load Clock Info Reference Stamp	0	7–55
Trend File	Number of Trends Available	4096	7–56
	Maximum Trend Size Available	4097	7–57
	Trend Command	–28672	7–58
	Trend Status	4097	7–60
	Setup Data Full	–28670	7–62
	All Info	4098	7–65
	Trigger Time	4099	7–68
	Run File Data	4100	7–70
	Stored File Data	4101	7–73
	Trend Parameter Definition	4102	7–75
	Trend Triggered Setup Parameter Values	4103	7–77

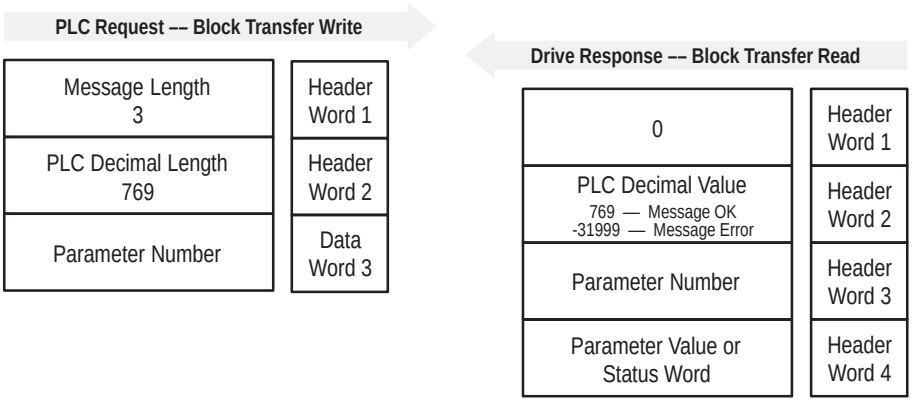
Parameter Read
Parameter Value Read

This message is sent by the PLC Communications Adapter Board and reads the 16–bit parameter data value for the parameter number selected.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 4 words

Message Structure



Message Operation

The Parameter Value Read function specified in the BTW reads a parameter value from the drive and places that value (or an error code) in word 4 of the BTR data file. The value shown is in device units.

If an error has occurred:

- Word 2 of the BTR returns a value of -31999.
- Word 4 contains the status code.

Parameter Value Read
(continued)

Example

In this example, the value of parameter 20 was requested from a 1336 FORCE and a value of 4096 was returned. 4096 is the internal drive unit value for the Maximum Rated Voltage Parameter. This corresponds to a value of 100% drive rated volts in display units.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	769	① 20							
BTR Data File	N10:90	0	769	① 20	① 4096						

① These values vary depending on parameters and products.

Parameter Read

Continuous Parameter Value Read

The Continuous Parameter Value Read function reads a continuous list of parameters beginning with the starting parameter number. You define the number of parameters to be read.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 5-64 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 4	Header Word 1
PLC Decimal Value 1	Header Word 2
Number of Parameter Values to Read	Data Word 3
Starting Parameter Number	Data Word 4

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 1 — Message OK -32767 — Message Error	Header Word 2
Number of Parameter Values to Read	Data Word 3
Starting Parameter Number	Data Word 4
Value Number 1 or Status Word	Data Word 5
Value Number 2 or Status Word	Data Word 6
Value Number 3 or Status Word	Data Word 7
•	•
•	•
Value Number 60 or Status Word	Data Word 64

Message Operation

The Continuous Parameter Value Read function specified in the BTW reads a consecutive group of parameter values from the device, beginning with the starting parameter number defined in word 4 of the BTW message. Word 3 of the BTW message defines the number of parameters to be read. The values return in the BTR response, beginning with word 5 of the message.

If an error has occurred in reading any of the values, the BTR returns a status word with a negative value instead of the parameter value.

Continuous Parameter Value Read
(continued)

Example

In this example, 60 parameters were read from a 1336 FORCE, beginning with parameter 10. The values of these parameters are returned in the BTR data file, beginning at N10:94. The values are in drive units.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	1	① 60	① 10						
BTR Data File	N10:90	0	1	① 60	① 10	① 0	① 0	① 0	① 0	① 0	① 100
	N10:100	① 0	① 50	① 4096	① 60	① 4096	① 1	① 6	① 0	① 1000	① 0
	N10:110	① 0	① 0	① 0	① 0	① 1000	① 1000	① 400	① 400	① 400	① 0
	N10:120	① 6144	① 2	① 4710	① 1	① 1	① 0	① 0	① 0	① 0	① 2
	N10:130	① 64	① 0	① 0	① 15	① 1024	① 0	① 0	① 5811	① 0	① 18
	N10:140	① 0	① 0	① 0	① 3597	① 0	① 12808	① 6	① 0	① 0	① 17952
	N10:150	① 0	① 0	① 0	① 0	① 0					

① These values vary depending on parameters and products.

Parameter Read

Scattered Parameter Value Read

The Scattered Parameter Value Read function reads a scattered list of parameters with each parameter you define. You must also define the number of parameters to be read.

PLC Block Transfer Instruction Data

BTW instruction length: 5-63 words
BTR instruction length: 5-63 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-63	Header Word 1
PLC Decimal Value 3	Header Word 2
Number of Parameter Values to Read	Data Word 3
Parameter Number 1	Data Word 4
0	Data Word 5
Parameter Number 2	Data Word 6
0	Data Word 7
Parameter Number 3	Data Word 8
0	Data Word 9
•	•
•	•
Parameter Number 30	Data Word 62
0	Data Word 63

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 3 — Message OK -32765 — Message Error	Header Word 2
Number of Parameter Values to Read	Data Word 3
Bit 15 / Parameter Number 1	Data Word 4
Parameter Value or Status Word 1	Data Word 5
Bit 15 / Parameter Number 2	Data Word 6
Parameter Value or Status Word 2	Data Word 7
Bit 15 / Parameter Number 3	Data Word 8
Parameter Value or Status Word 3	Data Word 9
•	•
•	•
Bit 15 / Parameter Number 30	Data Word 62
Parameter Value or Status Word 30	Data Word 63

Scattered Parameter Value Read (continued)

Message Operation

The Scattered Parameter Value Read function specified in the BTW reads a pre–defined group of parameter values, in any order, from the device. Word 3 of the BTW data file defines the number of parameters to be read. The parameters to be read and their order is defined starting with word 4. An unused word is left between each parameter request, so the BTR can respond with the parameter value as shown.

If an error has occurred in reading any of the parameters:

- Word 2 of the BTR returns a value of -32765.
- Bit 15 of the BTR word for the number of that parameter is set.
- The BTR word for the value of that parameter returns a status word instead of the parameter value.

Example

In this example, eight parameters were read from a 1336 FORCE, as defined in word 3 of the BTW data file. The requested parameter numbers were 5, 7, 8, 20, 18, 17, 19, and 36. The BTR response returned the values of these parameters into the BTR data file. These values are in drive units.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	19	3	① 8	① 5	0	① 7	0	① 8	0	① 20
	N10:20	0	① 18	① 0	① 17	0	① 19	0	① 36	0	
BTR Data File	N10:90	0	3	① 8	① 5	① 6	① 7	① 1000	① 8	① 1000	① 20
	N10:100	① 4096	① 18	① 4096	① 17	① 51	① 19	① 60	① 36	① 6144	

① These values vary depending on parameters and products.

Parameter Read
Parameter Read Full

The Parameter Read Full function provides the requesting remote I/O source with all known attributes for the parameters requested. This information includes the parameter's current value; descriptor; multiply and divide value; base value; offset value; text string; file, group, and element reference; minimum value; maximum value; default value; and unit text string.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 23 words

Message Structure

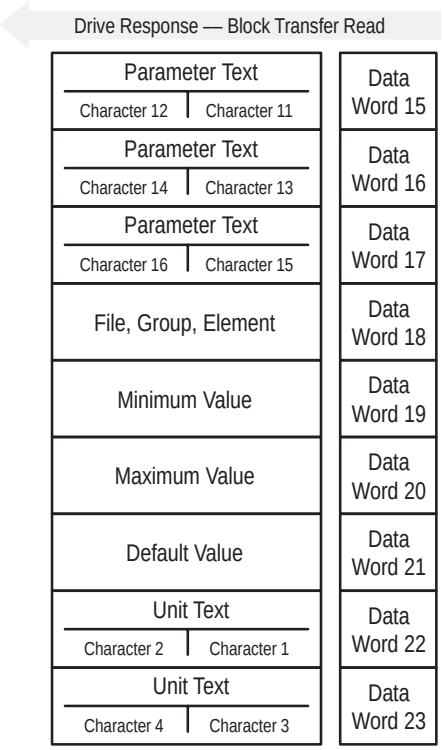
PLC Request — Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 768	Header Word 2
Parameter Number	Data Word 3

Drive Response — Block Transfer Read

0	Header Word 1
PLC Decimal Value 768 — Message OK -32000 — Message Error	Header Word 2
Parameter Number	Data Word 3
Parameter Value or Status Word	Data Word 4
Descriptor	Data Word 5
Multiply Value	Data Word 6
Divide Value	Data Word 7
Base Value	Data Word 8
Offset Value	Data Word 9
Parameter Text Character 2 | Character 1	Data Word 10
Parameter Text Character 4 | Character 3	Data Word 11
Parameter Text Character 6 | Character 5	Data Word 12
Parameter Text Character 8 | Character 7	Data Word 13
Parameter Text Character 10 | Character 9	Data Word 14

Parameter Read Full
(continued)



Message Operation

The Parameter Read Full function specified in the BTW retrieves the attributes of the requested parameter. The attributes for each parameter include the data, minimum and maximum values, and the parameter text. The response message returns this information, beginning with data word 4. The parameter text is returned with each data word containing two ASCII characters per word. This data returns with the first and second characters in opposite order as shown in the following example.

If an error has occurred in the block transfer, word 2 of the BTR returns a value of -32000.

Example

In this example, a Parameter Read Full was performed through block transfer on a 1336 FORCE. N10:10 shows the header message for the BTW. The data is returned in the BTR data file, starting with word 4, for parameter 101. Word 4 shows the present value in drive units. Words 5 through 9 provide scaling information, used to convert drive units to engineering units. Words 10 through 17 provide the parameter name.

Parameter Read Full (continued)

This example shows the response message N10:90 through N10:112 in both binary and ASCII. Note the ASCII information beginning with N10:99. The parameter name characters return in reverse order for each word. N10:99 has the ASCII value of *eV.* To read this, invert the word to read *Ve*. The next word *(space)l*, inverted gives you *l(space)*. These words, along with the following two words, form the word *Velocity.* The parameter name *Vel Ref1Hi* can be seen in words 10 through 17 of the response message. In addition, word 23 is also returned in this format. This word provides the units the parameter is defined in, which in this example is *RPM*.

Word 18 contains the file, group, and element which are used to reference the parameter.

Words 19 through 21 contain the minimum, maximum, and default values of this parameter.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	768	① 101							
BTR Data File	N10:90	0	768	① 101	① 2801	① 4364	① 1755	① 4096	① 10	① 0	① 25942
	N10:100	① 8300	① 25938	① 8294	① 8241	① 26952	① 8224	① 8224	① 548	① -32767	① 32767
	N10:110	① 0	① 2562	① 8269							
	N10:90	\00\00	\05\00	\00\0E	\0A\F1	\11\0E	\06\03	\10\00	\00\0A	\00\00	eV
	N10:100	l (sp)	eR	1f	iH		\025	C\01	\7F\FF	04 00	\13 0
	N10:110	\00\00	PR	M							

ASCII Display Values

① These values vary depending on parameters and products.

Parameter Write
Parameter Value Write

This message sent by the PLC Communications Adapter Board reads the 16–bit parameter data value for the parameter number selected.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 4	Header Word 1
PLC Decimal Value -31999	Header Word 2
Parameter Number	Data Word 3
Parameter Value	Data Word 4

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 769 — Message OK -31999 — Message Error	Header Word 2
Parameter Number	Data Word 3
Parameter Value or Status Word	Data Word 4

Message Operation

The Parameter Value Write function specified in the BTW sends a new value (specified in word 4 of the BTW header message) to the parameter specified in the BTW header word 3. The value must be in device units.

If an error has occurred:

- Word 2 of the response returns a value of -31999.
- Word 4 contains a status code.

Example

In this example, a value of 4096 was sent to parameter 20. 4096 is in drive units and indicates a value of 100% of rated drive volts as defined by parameter 147, Drive Rated Volts.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	-31999	① 20	① 4096						
BTR Data File	N10:90	0	769	① 20	① 4096						

① These values vary depending on parameters and products.

Parameter Write

Continuous Parameter Value Write

The Continuous Parameter Value Write function writes to a continuous list of parameters beginning with the starting parameter number.

PLC Block Transfer Instruction Data

BTW instruction length: 5-64 words
BTR instruction length: 5-64 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-64	Header Word 1
PLC Decimal Value -32767	Header Word 2
Number of Parameter Values to Write	Data Word 3
Starting Parameter Number	Data Word 4
Value Number 1	Data Word 5
Value Number 2	Data Word 6
Value Number 3	Data Word 7
•	•
•	•
Value Number 60	Data Word 64

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 1 — Message OK -32767 — Message Error	Header Word 2
Number of Parameter Values to Write	Data Word 3
Starting Parameter Number	Data Word 4
Status Word	Data Word 5
Status Word	Data Word 6
Status Word	Data Word 7
•	•
•	•
Status Word	Data Word 64

Message Operation

The Continuous Parameter Value Write function specified in the BTW writes data values to a consecutive group of parameters, beginning with the starting parameter number defined in word 4 of the BTW message. The number of parameters to be written to is defined in word 3 of the BTW message.

If an error has occurred in writing to any of the values, the BTR data file status word contains an error code. If no error has occurred, it returns a value of 0.

Continuous Parameter Value Write
(continued)

Example

In this example, eight 1336 FORCE parameter values were written to, starting with parameter 10. The eight parameter values are in device units. Because all of the parameter values were accepted, values of 0 were returned in the BTR status words.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	12	-32767	① 6	① 10	① 1	① 1	① 1	① 1	① 1	① 101
	N10:20	① 1	① 51								
BTR Data File	N10:90	0	1	① 8	① 10	① 0	① 0	① 0	① 0	① 0	① 0
	N10:100	① 0	① 0								

① These values vary depending on parameters and products.

Parameter Write

Scattered Parameter Value Write

The Scattered Parameter Value Write function writes to a list of parameters and returns the status of each parameter in its value location. Parameter numbers do not need to be in consecutive order.

PLC Block Transfer Instruction Data

BTW instruction length: 5-63 words
BTR instruction length: 5-63 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-63	Header Word 1
PLC Decimal Value -32765	Header Word 2
Number of Parameter Values to Write	Data Word 3
Parameter Number 1	Data Word 4
Parameter Value 1	Data Word 5
Parameter Number 2	Data Word 6
Parameter Value 2	Data Word 7
Parameter Number 3	Data Word 8
Parameter Value 3	Data Word 9
•	•
•	•
Parameter Number 30	Data Word 62
Parameter Value 30	Data Word 63

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 3 — Message OK -32765 — Message Error	Header Word 2
Number of Parameter Values to Write	Data Word 3
Bit 15 | Parameter Number 1	Data Word 4
Status Word 1	Data Word 5
Bit 15 | Parameter Number 2	Data Word 6
Status Word 2	Data Word 7
Bit 15 | Parameter Number 3	Data Word 8
Status Word 3	Data Word 9
•	•
•	•
Bit 15 | Parameter Number 30	Data Word 62
Parameter Value or Status Word 30	Data Word 63

Scattered Parameter Value Write (continued)

Message Operation

The Scattered Parameter Value Write function specified in the BTW writes data values to a defined group of parameters in any order. Word 3 of the BTW data file defines the number of parameters to be written to. The parameters to be written to, and their order is defined starting with word 4. The BTR response message returns a status word for each value written to, indicating whether the parameter write was successful.

If a transfer is not successful for a given parameter, the value in the parameter number location is negative (bit 15 is set to 1).

If an error occurs, the response returns a status code for the error.

Example

In this example, six parameters were written to in a 1336 FORCE. Word 3 of the BTW message (N10:12) defines the number of parameter values that are transferred. Each parameter number followed by its value is listed in the message beginning with Word 4. The values are entered in drive units. The BTR response (N10:90) returns the status of each parameter write.

Note that a value of 600 was sent to parameter 392 (words N10:7 and N10:8). Word N10:91 indicates the block transfer operation was not completely successful. If all parameter values had been successfully transferred, N10:91 would contain the value 3. Word N10:97 contains a negative value indicating the error occurred with parameter 392. Word N10:98 contains the status code indicating the parameter value is out of range.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	15	-32767	① 6	① 90	① 1	① 150	① 4	① 392	① 6000	① 31
	N10:20	① 10	① 10	① 2	① 12	① 5					
BTR Data File	N10:90	0	-32765	① 6	① 90	① 0	① 150	① 0	① 392	① 6	① 31
	N10:100	① 0	① 10	① 0	① 12	① 0					

① These values vary depending on parameters and products.

Fault Queue
Fault Clear/Reset

The Fault Clear/Reset message activates one of several fault queue related functions shown in the message request.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 4	Header Word 1
PLC Decimal Value -30976	Header Word 2
0	Header Word 3
Fault Command	Data Word 4

Message Request

Value	EE Command
00	Not Used
01	Clear Fault
02	Clear Fault Queue
03	Drive Reset

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 1792 — Message OK -30976 — Message Error	Header Word 2
0	Data Word 3
Status Word	Data Word 4

Message Operation

The Fault Clear/Reset function specified in the BTW sends a fault handling request to the drive.

- A Clear Fault Request clears the last fault that occurred and makes the drive available to run.
- A Clear Fault Queue clears the entire fault buffer.
- A Drive Reset resets the drive and clears any parameters or links not saved. Parameter information stored in EEPROM is written to RAM.

If an error has occurred in the block transfer, word 2 of the BTR returns a value of -30976.

Fault Clear/Reset
(continued)

Example

In this example, a Fault Clear Request was sent to the drive through the block transfer. The BTR response indicated a successful clear by returning a value of 1792 in word 2, and a value of 0 in word 4.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	-30976	0	1						
BTR Data File	N90:0	0	1792	0	① 0						

① This value varies depending on parameters and products.

Fault Queue
Trip Fault Queue Number

The Trip Fault Queue Number message provides the fault queue number of the fault that caused the drive to trip.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message 3	Header Word 1
PLC Decimal Value 1793	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 1793 — Message OK -30975 — Message Error	Header Word 2
0	Header Word 3
Fault Queue Size	Header Word 4

Message Operation

The Trip Fault Queue Number function provides the entry number of the fault in the fault queue that tripped the drive The BTR response contains that number in word 4. The Fault Queue Number is 0 when the drive is not faulted.

If an error has occurred in the block transfer, word 2 of the response will be -30975.

Example

In this example, the first entry in the drive fault queue has caused the drive to trip. Word 4 of the BTR indicates the entry number.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	1794	0							
BTR Data File	N10:90	0	1794	0	① 1						

① These values vary depending on parameters and products.

Fault Queue
Fault Entry Read Full

The Fault Entry Read Full function reads the contents of the fault queue entry number specified. A message is returned that includes the fault text and fault code associated with the specified fault queue entry and the time stamp associated with the fault.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 12 or 16 words

Message Structure

PLC Request –– Block Transfer Write

Message 3	Header Word 1
PLC Decimal Value 1792	Header Word 2
Fault Queue Entry Number	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 1792 — Message OK -30976 — Message Error	Header Word 2
Fault Queue Entry Number	Data Word 3
Fault Text: Character 2 | Character 1	Data Word 4
Fault Text: Character 4 | Character 3	Data Word 5
Fault Text: Character 6 | Character 5	Data Word 6
Fault Text: Character 8 | Character 7	Data Word 7
Fault Text: Character 10 | Character 9	Data Word 8
Fault Text: Character 12 | Character 11	Data Word 9
Fault Text: Character 14 | Character 13	Data Word 10
Fault Text: Character 16 | Character 15	Data Word 11
Fault Code Value	Data Word 12
Clock Time: Seconds | Ref	Data Word 13
Clock Time: Hour | Minute	Data Word 14
Clock Time: Date | Day	Data Word 15
Clock Time: Year | Month	Data Word 16

Fault Entry Read Full
(continued)

Message Operation

The Fault Queue Entry Read Full function specified in the BTW reads the contents of the fault queue for the input entry number specified in word 3 of the BTW message. The response returns the fault text which you can view as ASCII text. The text will have every two characters in reverse order and return a time stamp, indicating the day and time the fault occurred. The Clock Time is returned in the order shown in the header message. You should view this information as ASCII text.

This field:	Indicates:
Reference	am or pm, where 0 is am and 1 is pm.
Date	The date of the month in ASCII.
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

If an error has occurred, word 2 of the response returns a negative value.

Example

In this example, Fault Queue Entry #3 was retrieved from the drive. The BTR response returned the ASCII text Drive Reset Flt, with each two characters reversed. The Fault Code for this example is 22.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	1792	① 3							
BTR Data File	N10:90	0	1792	① 3	① 29252	① 30313	① 8293	① 25938	① 25971	① 8308	① 27718
	N10:100	① 8308	① 22	7681	3594	5893	1282				
	N10:90	0	07\00	03\00	r D	V i	e	e R	e s	t	l F
	N10:100	t	00\16	1E\01	0E\0A	17\05	05\02				

ASCII Display Values

① These values vary depending on parameters and products.

Warning Queue
Warning Clear

The Warning Clear message issues either a Clear Fault/Warning command or a Clear Warning Queue command to the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 4	Header Word 1
PLC Decimal Value -30720	Header Word 2
0	Header Word 3
Warning Command	Header Word 4

Message Request

Value	EE Command
00	Not Used
01	Clear Fault/Warning
02	Clear Warning Queue

This bit indicates the status of the request.

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2048 — Message OK -30720 — Message Error	Header Word 2
0	Data Word 3
Warning Command RET	Data Word 4

Message Request

Value	EE Command
0	Message OK
1	Message Error

This bit indicates the status of the response.

Message Operation

The Warning Clear function specified in the BTW sends a warning fault handling request to the drive. Word 4 of the BTW defines which handling option is requested:

- If word 4 has a value of 1, this message clears the last fault.
- If word 4 has a value of 2, this message clears the entire warning fault queue.

If an error has occurred in the request, word 2 of the BTR returns a value of -30975. Word 4 of the BTR responds to the request of BTW word 4.

Warning Clear
(continued)

Example

In this example, a Clear Fault/Warning request was sent to the drive by putting a value of 1 in word 4 of the BTW. Word 2 of the BTR indicated a successful clear by returning a value of 2048.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	-30720	0	01						
BTR Data File	N10:90	0	2048	0	1						

Warning Queue

Warning Queue Read Full

The Warning Queue Read Full function reads the contents of the specified warning queue entry number. A message is returned that includes the warning text and warning code associated with the specified warning queue entry and the time stamp associated with the fault.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 16 words

Message Structure

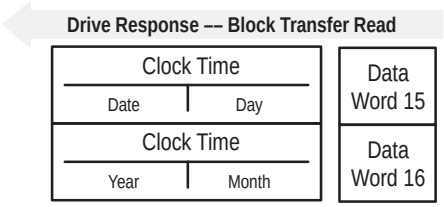
PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 2048	Header Word 2
Warning Queue Entry Number	Data Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2048 — Message OK -30720 — Message Error	Header Word 2
Warning Queue Entry Number	Header Word 3
Warning Text Character 2 | Character 1	Data Word 4
Warning Text Character 4 | Character 3	Data Word 5
Warning Text Character 6 | Character 5	Data Word 6
Warning Text Character 8 | Character 7	Data Word 7
Warning Text Character 10 | Character 9	Data Word 8
Warning Text Characcter 12 | Character 11	Data Word 9
Warning Text Character 14 | Character 13	Data Word 10
Warning Text Character 16 | Character 15	Data Word 11
Warning Code Value	Data Word 12
Clock Time Second | 1/10 of Second	Data Word 13
Clock Time Hour | Minute	Data Word 14

Warning Queue Read Full
(continued)



Message Operation

The Warning Queue Entry Read Full function specified in the BTW reads the contents of the warning queue specified in word 3 of the BTW message. The response returns the warning text which can be shown as ASCII text. The text will have every two characters in reverse order and return a time stamp indicating the day and time the warning occurred. The Clock Time is returned in the order shown in the header message. You should view this information as ASCII text.

This field:	Indicates:
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

The Date and Time are in hexadecimal format.

Example

In this example, Warning Queue Entry #1 was retrieved from the drive. The BTR returned the ASCII text Vel Fdbk Loss, with each two characters reversed. The fault occurred at 10:14am on Thursday February 23, 1995.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	2048	1							
BTR Data File	N10:90	0	2048	1	25942	8300	25670	27490	19488	29551	8307
	N10:100	8224	5048	7681	3594	5893	1282				
	N10:90	00\00	08\00	00\01	eV	l	df	kb	L	so	s
	N10:100	00\00	13\B8	1E\01	0E\0A	17\05	05\02				

ASCII Display Values

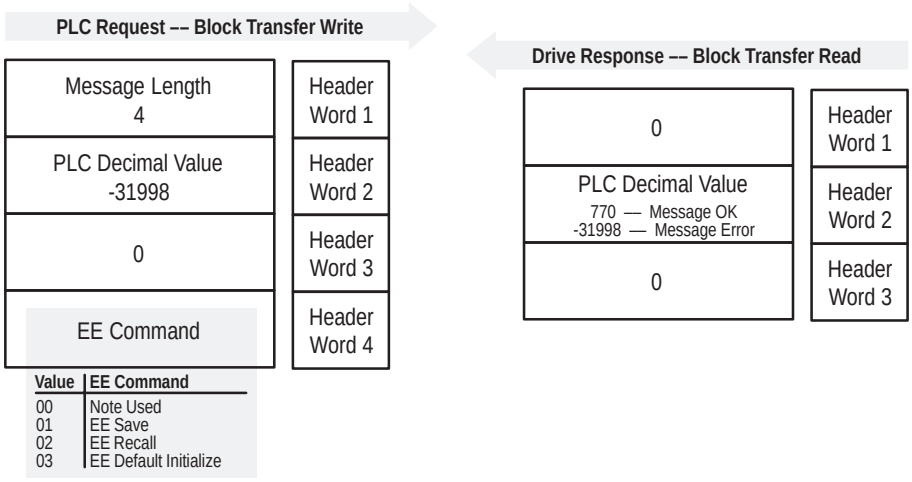
EE Memory Request
Save/Recall/Initialize

This message is sent by the PLC Communications Adapter Board to activate the BRAM functions detailed in the message request.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 3 words

Message Structure



Message Operation

The BRAM memory function allows three different message requests:

- BRAM Save saves parameter and link information from working memory or RAM to BRAM.
- EE Recall retrieves the last saved data from BRAM and places it in working memory or RAM.
- EE Default Initialize sets all parameter values and links to default in RAM without altering contents in BRAM.

If an error has occurred, word 2 of the response returns a value of -31998.

Save/Recall/Initialize
(continued)

Example

This example is requesting an EEPROM save.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	-31998	① 0	① 1						
BTR Data File	N10:90	0	770	① 0							

① These values vary depending on parameters and products.

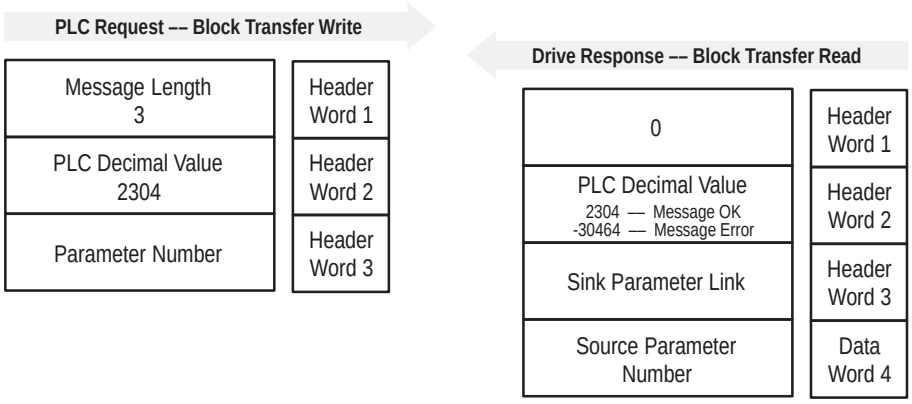
Link Read
Link Parameter Read

The Link Parameter Read message reads the source parameter number that is linked to the specified sink parameter.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 4 words

Message Structure



Message Operation

The Link Parameter Read function specified in the BTW reads the source parameter that is linked to the requested sink parameter, defined in word 3 of the header message. The source parameter is returned in word 4 of the BTR.

If an error has occurred, word 2 of the BTR returns a value of -30464.

Example

In this example, the link associated with parameter 101 was requested from the drive. The BTW header message word 4 defines the sink parameter of the requested link with a value of 101. The linked source parameter 330 is returned in word 4 of the BTR.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	3	2304	101	0						
BTR Data File	N10:90	0	2304	101	330						

Link Read

Continuous Parameter Link Read

The Continuous Parameter Link Read message returns a list of up to 60 parameters that are linked to each drive parameter in a consecutive list.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 5-64 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 4	Header Word 1
PLC Decimal Value 4	Header Word 2
Number of Parameter Links to Read	Data Word 3
Starting Parameter Number	Data Word 4

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 4 — Message OK -327664 — Message Error	Header Word 2
Number of Parameter Links to Read	Data Word 3
Starting Parameter Number	Data Word 4
Source Parameter Number 1	Data Word 5
Source Parameter Number 2	Data Word 6
•	Data Word
•	Data Word
•	Data Word
Source Parameter Number 60	Data Word 64

Message Operation

The request must specify the number of links to be read and the starting sink parameter number. The response returns the parameter number of the source that is linked to each sink parameter. The response returns links for a consecutive list of sink parameters (up to 60 links). If a parameter is not linked, a value of 0 is returned.

Continuous Parameter Link Read (continued)

Example

A Continuous Parameter Link Read is requested for nine parameter links (word N10:2) beginning with parameter 359. The block transfer response returns the source parameters that are linked to parameters 359 through 367. In this example:

- Parameter 359 is linked to parameter 56.
- Parameter 360 is linked to parameter 143.
- Parameter 367 is linked to parameter 380.
- Parameters 361 through 366 are not linked.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	4	4	9	359						
BTR Data File	N10:90	0	4	9	359	56	360	59	361	81	362
	N10:100	80	363	168	364	167	365	134	366	26	367
	N10:110	330									

Link Read

Scattered Parameter Link Read

The Scattered Parameter Link Read message returns a list of up to 30 links in the source-to-sink order found in the drive. The links do not have to be in consecutive order.

PLC Block Transfer Instruction Data

BTW instruction length: 5-63 words
BTR instruction length: 5-63 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-63	Header Word 1
PLC Decimal Value 5	Header Word 2
Number of Parameter Links to Read	Data Word 3
Parameter Number 1	Data Word 4
0	Data Word 5
Parameter Number 2	Data Word 6
0	Data Word 7
•	•
•	•
•	•
Parameter Number 30	Data Word 62
0	Data Word 63

Drive Response –– Block Transfer Read

0		Header Word 1
PLC Decimal Value 5 — Message OK -32763 — Message Error		Header Word 2
Number of Parameter Links to Read		Data Word 3
Bit 15	Parameter Number 1	Data Word 4
Source Parameter Number 1		Data Word 5
Bit 15	Parameter Number 2	Data Word 6
Source Parameter Number 2		Data Word 7
•		•
•		•
•		•
Bit 15	Parameter Number 30	Data Word 62
Source Parameter Number 30		Data Word 63

Message Operation

The Scattered Parameter Link Read function requested in the BTW reads up to 30 non-consecutive links made in the drive. You request the desired link information by defining the sink parameters in the BTW message.

Scattered Parameter Link Read
(continued)

The corresponding source parameters are returned through the BTR response.

If an error has occurred in reading any of the links:

- Word 2 of the BTR returns a value of -32763.
- Bit 15 of the BTR word for the number of that link is set, making the value negative.

Example

In this example, a Scattered Parameter Link Read of four links was requested through the BTW. Sink parameters 119 through 367 and 401 were defined as the desired links to be read. The BTR returned the corresponding source parameter values in the words reserved for this information. If an error had occurred for a specific link, the value returned would be negative.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	12	5	4	119	0	368	0	367	0	401
	N10:20	0									
BTW Data File	N10:90	0	5	4	119 Sink	0 Source	368 Sink	331 Source	367	330	401
	N10:100	0									

Link Write
Link Parameter Write

The Link Parameter Write message writes the source parameter link to the linkable sink parameter. This function writes only one link.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

4	Header Word 1
PLC Decimal Value -30464	Header Word 2
Sink Parameter Number	Header Word 3
Link Parameter	Data Word 4

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2304 — Message OK -30464 — Message Error	Header Word 2
Sink Parameter Number	Header Word 3
Link Parameter	Data Word 4

Message Operation

The Link Parameter Write function specified in the BTW writes the corresponding source parameter link to the defined linkable sink parameter. The sink parameter is defined in word 3 of the BTW data file with its linked source defined in word 4.

If an error has occurred in the link, word 2 of the BTR returns a value of -30464.

Example

In this example, a link was defined between the sink parameter defined in word 3 (parameter 101, External Velocity Reference), and the source parameter (parameter 340, Analog Input 2). The BTR header message confirmed the link by returning a value of 2034 in word 2, and the link in order of sink-to-source in words 3 and 4.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	4	-30464	101	340						
BTR Data File	N10:90	0	2304	101	340						

Link Write

Continuous Parameter Link Write

The Continuous Parameter Link Write message writes a list of up to 60 consecutive links to the drive, starting at the defined sink parameter.

PLC Block Transfer Instruction Data

BTW instruction length: 5-64 words
BTR instruction length: 5-64 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-64	Header Word 1
PLC Decimal Value -32764	Header Word 2
Number of Parameter Links to Write	Header Word 3
Parameter Number 1	Data Word 4
Link Number 1	Data Word 5
Link Number 2	Data Word 6
•	•
•	•
•	•
Link Number 60	Data Word 64

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 4 — Message OK -32764 — Message Error	Header Word 2
Number of Parameter Links to Write	Header Word 3
Starting Parameter Number	Data Word 4
Status Number 1	Data Word 5
Status Number 2	Data Word 6
•	•
•	•
•	•
Status Number 60	Data Word 64

Message Operation

The Continuous Parameter Link Write function specified in the BTW writes a set of consecutive links to the drive. Word 3 of the BTW defines the number of links to be written. Word 4 defines the starting sink parameter. The consecutive link source parameters are then listed in the remaining header words. You can make up to 60 continuous links with this block transfer function.

Continuous Parameter Link Write (continued)

Example

In this example, a group of four continuous links were sent to the drive, starting at parameter 119. Word 3 of the BTW header message defines a length of four links. Word 4 defines the starting link sink parameter 119. Words 5 through 8 list the source parameters that are linked to the four continuous sink parameters, parameters 119 through 122. The BTR message returns the status of the write request. Zeros returned in words 5 through 8 indicate that the write was successful.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	8	-32764	4	119	339	340	341	342		
BTR Data File	N10:90	0	4	4	119	0	0	0	0		

Link Write

Scattered Parameter Link Write

The Scattered Parameter Link Write function writes a scattered group of links to the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 5-63 words
BTR instruction length: 5-63 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 5-63	Header Word 1
PLC Decimal Value -32763	Header Word 2
Number of Parameter Links to Write	Header Word 3
Parameter Number 1	Data Word 4
Link Number 1	Data Word 5
Parameter Number 2	Data Word 6
Link Number 2	Data Word 7
•	•
•	•
•	•
Parameter Number 30	Data Word 62
Link Number 30	Data Word 63

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 5 — Message OK -32763 — Message Error	Header Word 2
Number of Parameter Links to Write	Header Word 3
Bit 15 / Parameter Number 1	Data Word 4
Status 1 or Error Code	Data Word 5
Bit 15 / Parameter Number 2	Data Word 6
Status 2 or Error Code	Data Word 7
•	•
•	•
•	•
Bit 15 / Parameter Number 30	Data Word 62
Status 30 or Error Code	Data Word 63

Message Operation

The Scattered Parameter Link Write function in this BTW writes up to 30 non-consecutive links in any order from the drive. Word 3 of the BTW defines the number of links to write.

Scattered Parameter Link Write (continued)

The links are then defined, followed by each sink's corresponding source in the remainder of the header message. You can define up to 30 scattered links with this function. If an incorrect link is defined, the BTR response returns a negative value for the sink parameter, followed by a status or error code.

If there is an error in the block transfer, word 2 of the BTR contains a value of -32763.

Example

In this example, four scattered links were written to the drive as defined in word 3 of the BTW. Words 4 and 5 (N10:3 and N10:4) contain the first link with word 4 defining the sink parameter, and word 5 the corresponding source. Words 6 and 7 (N10:5 and N10:6) contain the next link, in the order of sink-to-source. The remaining two links are contained in words 8 through 11 (N10:7-10). The BTR responds with 0 in place of the source parameter to indicate a successful link.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	11	-32763	4	387	146	388	168	367	330	368
	N10:20	331									
BTR Data File	N10:90	0	5	4	387	0	388	0	367	0	368
	N10:100	0									

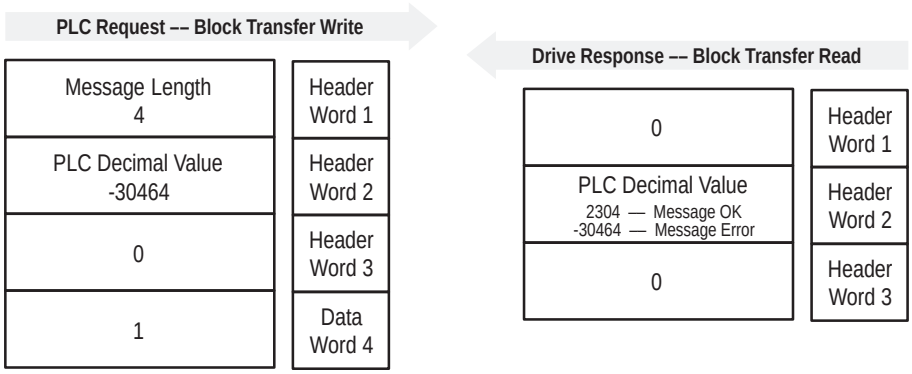
Link Write
Parameter Link Clear

The Parameter Link Clear message deletes all user–configured parameter links in the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 3 words

Message Structure



Message Operation

When this request is sent to the drive, all drive parameter links that you configured are deleted.

If an error has occurred, word 2 of the BTR returns -30464.

Example

In this example, a Parameter Link Clear request was sent through the BTW. The BTR was only required to check for an error.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:0	4	-30464	0	1						
BTR Data File	N10:90	0	2304	0							

User Text String

User Text String Read

This read–only message retrieves from the drive the user custom product name/location test string which identifies the product. The text string is 16 characters long.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 11 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 261	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 261 — Message OK -32507 — Message Error	Header Word 2
0	Header Word 3
Product Text Character 2 | Character 1	Data Word 4
Product Text Character 4 | Character 3	Data Word 5
Product Text Character 6 | Character 5	Data Word 6
Product Text Character 8 | Character 7	Data Word 7
Product Text Character 10 | Character 9	Data Word 8
Product Text Character 12 | Character 11	Data Word 9
Product Text Character 14 | Character 13	Data Word 10
Product Text Character 16 | Character 15	Data Word 11

Message Operation

This operation reads your custom product test string stored in the drive. The response message returns this information beginning with data word 4. The text string is returned with each data word containing two ASCII characters per word. This data returns with the first and second characters in opposite order as shown in the example.

User Text String Read
(continued)

If an error has occurred in the BTW, word 2 of the BTR returns a value of -32507.

Example

In this example, the BTW defined a User Text String Read request in word 2 of the BTW with a value of 261. The BTR responds by returning a value of 261 in word 2, indicating a successful read. In addition, it returned the user text string in data words 4 through 11 stored in the drive. The characters of each word are returned in reverse order. The user text string should read Press 8 Level 2.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	261	0							
	N10:20	\00\03	\01\05	\00\00							
BTR Data File	N10:90	0	261	0	21072	21317	8275	8248	17740	17750	8268
	N10:100	12832									
	N10:90	00\00	01\05	00\00	rP	se	s	8	el	ev	L
	N10:100	2									

ASCII Display Values

User Text String

User Text String Write

This is a write message that stores in the drive your custom product name/location text string which identifies the product. The text string is 16 characters long.

PLC Block Transfer Instruction Data

BTW instruction length: 11 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 11	Header Word 1
PLC Decimal Value -32507	Header Word 2
0	Header Word 3
Product Text: Character 2 | Character 1	Data Word 4
Product Text: Character 4 | Character 3	Data Word 5
Product Text: Character 6 | Character 5	Data Word 6
Product Text: Character 8 | Character 7	Data Word 7
Product Text: Character 10 | Character 9	Data Word 8
Product Text: Character 12 | Character 11	Data Word 9
Product Text: Character 14 | Character 13	Data Word 10
Product Text: Character 16 | Character 15	Data Word 11

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 261 — Message OK -32507 — Message Error	Header Word 2
Error Code	Header Word 3
0	Data Word 4

Message Operation

The User Text String Write allows you to write a custom product identification string to the drive. This string can be 16 ASCII characters long and is defined in the 8 words of the BTW. You must enter the characters in the order shown, with the first and second character of each word entered in opposite order as shown in the example.

User Text String Write
(continued)

Example

In this example, the BTW defined a text string of Press 8 Level 2 to be written to the drive. This information was entered in ASCII text, with the two characters of each word entered in opposite order. The BTR returned a value of 261 in word 2, indicating a successful write. In addition, it returned the text string in words 4 through 11.

If an error had occurred in the BTW, the BTR would have returned an error code in word 3 of -32507.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	11	-32507	0	21072	21317	8275	8248	17740	17750	8268
	N10:20	12832									
	N10:10	00\0B	7E\FB	00\00	rP	se	s	8	el	ev	L
	N10:20	2									
BTR Data File	N10:90	0	261	0	21072	21317	8275	8248	17740	17750	8268
	N10:100	12832									

ASCII Display Values

Clock Data

Real Time Clock Data Read

The Real Time Clock Data Read message is provided to allow the drive to read the specified real–time clock. The slave device can read the time in seconds, minutes, and hours as well as the day, date, month, and year.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 7 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 2816	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2816 — Message OK -29952 — Message Error	Header Word 2
0	Header Word 3
Clock Time Seconds | 10ths of MS	Data Word 4
Clock Time Hour | Minute	Data Word 5
Clock Time Date | Day	Data Word 6
Clock Time Year | Month	Data Word 7

Message Operation

The Real Time Clock Data Read function reads the real–time clock data from the drive. The Clock Time is returned in the order shown in the header message. You should view this information as ASCII text.

The Time is based on a 24–hour clock.

Real Time Clock Data Read
(continued)

This field:	Indicates:
Seconds	The seconds and tenths of milliseconds.
Date	The date of the month in ASCII.
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

If an error occurs in the block transfer, a value of -29952 is returned in word 2 of the BTR response.

Example

In this example, the clock was read with a value of 2816 in word 2 of the BTW. The BTR response indicated a successful read with a value of 2816 in word 2.

- Word 4 indicated a changing value for seconds.
- The Hour value 0E indicates hour 14 of a 24 hour clock, or 2 pm. The minute value 0A indicates 10, or 12:10 pm.
- The Date of 17 in ASCII is the 23rd and the 5th day of the month, or Thursday.
- The Year 05 is 1995.
- The Month of 02 is February.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	2816	0							
BTR Data File	N10:90	0	2816	0	7681	3594	5893	1282			
	N10:90				0E\01 S\.1S	0E\0A Hr\Min	17\05 Date\Day	05\02 Yr\Mth			

ASCII Display Values

Clock Data

Real Time Clock Data Write

The Real Time Clock Data Write message is provided to allow the drive to write the specified real–time clock data. This allows you to write the new real–time clock seconds, minutes, and hours, as well as the day, date, month, and year.

PLC Block Transfer Instruction Data

BTW instruction length: 7 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 7	Header Word 1
PLC Decimal Value 2816	Header Word 2
0	Header Word 3
Clock Time: Seconds | 10ths of MS	Data Word 4
Clock Time: Hour | Minute	Data Word 5
Clock Time: Date | Day	Data Word 6
Clock Time: Year | Month	Data Word 7

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2816 — Message OK -29952 — Message Error	Header Word 2
0	Header Word 3

Message Operation

The Real Time Clock Data Write function allows you to define the clock data for the drive. The clock time is written in the order shown in the header message. This information should be sent as ASCII text.

The Time is based on a 24–hour clock.

Real Time Clock Data Write
(continued)

This field:	Indicates:
Seconds	The seconds and tenths of milliseconds.
Date	The date of the month in ASCII.
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

If an error occurs in the block transfer, a value of -29952 is returned in word 2 of the BTR response.

Example

In this example, a real–time clock data value of Friday, February 10, 1995 12:00 am was written to the drive. Word 2 defines the request with a value of 2817.

- Word 4 defines 0 seconds.
- Word 5 defines 12:00.
- Word 6 defines the sixth day (Friday) with a date of the tenth.
- Word 7 defines 1995 and the second month (February).

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	7	2816	0	0000	0000	2566	1283			
	N10:10				00\01 S\.1S	00\00 Hr\Min	0A\06 Date\Day	05\02 Yr\Mth			
BTR Data File	N10:90	0	2816	0							

ASCII Display Values

Run Time Accumulator

Run Time Accumulator Data Read

The Run Time Accumulator Data Read message provides the drive with the accumulated time for running services. This information is in hours and is read only. This function is typically used as a maintenance feature.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 2817	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2817 — Message OK -29951 — Message Error	Header Word 2
0	Data Word 3
Accumulated Value in Hours	Data Word 4

Message Operation

The Run Time Accumulator Data Read through BTR word 4, provides the running service time in hours. As a maintenance feature, you can use this information to help define a service schedule for the drive.

You can clear the accumulated time through a Clear Run Time Accumulator request. Information can then provide the accumulated run time between each scheduled service.

Run Time Accumulator Data Read
(continued)

Example

In this example, the BTW requested the accumulated running time of the drive. The BTR response returned a value of 41 in word 4, indicating a running time of 41 hours. This value can be monitored, and when a specified running time has accumulated, a maintenance down time can be scheduled.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	0	2817	0							
BTR Data File	N10:90	0	2817	0	41						

Run Time Accumulator

Clear Run Time Accumulator

The Clear Run Time Accumulator message provides a way of clearing the run time accumulator data stored in the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value -29950	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

Message Length 3	Header Word 1
PLC Decimal Value 2818 — Message OK -29950 — Message Error	Header Word 2
0	Header Word 3

Message Operation

The Clear Run Time Accumulator defines a value of -29950 in the BTW. Word 2 can clear the accumulated run time stored in the drive. This allows you to monitor an accumulated time based on a specific event.

Example

This function was requested to clear the accumulated run time in the drive since the last scheduled maintenance downtime. In this example, the BTW requested a clear with a value of -29950 in word 2. The BTR response indicated a successful clear by returning a value of 2818 in word 20 of the BTR header message.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	-29950	0							
BTR Data File	N10:90	3	2818	0							

Time Stamp

Reference Time Stamp Data Read

The Reference Time Stamp Data Read message reads the reference time stamp value from the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 7 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 2816	Header Word 2
Reference Number	Header Word 3

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2816 — Message OK -29952 — Message Error	Header Word 2
0	Header Word 3
Clock Time Seconds | 10ths of MS	Data Word 4
Clock Time Hour | Minute	Data Word 5
Clock Time Date | Day	Data Word 6
Clock Time Year | Month	Data Word 7

Message Operation

You can define the reference time stamp to monitor the time of a specific event. This function allows this time to be read from the device. The time stamp is returned in the order shown in the header message. This information should be viewed as ASCII text.

The Time is based on a 24–hour clock.

This field:	Indicates:
Seconds	The seconds and tenths of milliseconds.
Date	The date of the month in ASCII.
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

Reference Time Stamp Data Read
(continued)

If an error occurs in the BTW, a value of -29952 is returned in word 2 of the BTR response.

Example

In this example, a reference time stamp data read was requested through the BTW. Word 2 of the BTW defines this request with a decimal value of 2816 for the PLC command code. The BTR response indicates a successful request with a returned value of 2816 in BTR word 2. Words 4 through 7 then return the clock data. The clock data indicates a time stamp of February 1995, the fifth day of the week (Thursday), and a date of 23 (17 in ASCII). The hour, minutes, and seconds change according to the time.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	2816	0							
BTR Data File	N10:90	0	2816	0	7681	3594	5893	1282			
	N10:90				0E\01 S\.1S	0E\0A Hr\Min	17\05 Date\Day	05\02 Yr\Mth			

ASCII Display Values

Time Stamp

Reference Time Stamp Data Write

The Reference Time Stamp message is provided to allow the drive to write the specified real–time clock. This allows the drive to write a new reference stamp.

PLC Block Transfer Instruction Data

BTW instruction length: 7 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 7	Header Word 1
PLC Decimal Value -29952	Header Word 2
0	Header Word 3
Clock Time: Seconds | 10ths of MS	Data Word 4
Clock Time: Hour | Minute	Data Word 5
Clock Time: Date | Day	Data Word 6
Clock Time: Year | Month	Data Word 7

Drive Response –– Block Transfer Read

0	Header Word 1
PLC Decimal Value 2816 — Message OK -29952 — Message Error	Header Word 2
0	Header Word 3

Message Operation

The Reference Time Stamp Data Write allows you to define a specific time stamp to be used in the drive.

The Time is based on a 24–hour clock.

This field:	Indicates:
Seconds	The seconds and tenths of milliseconds.
Date	The date of the month in ASCII.
Day	The day of the week, where 1 is Sunday and 7 is Saturday.
Year	The number of the year. 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5.
Month	The month of the year, where 1 is January and 12 is December.

Reference Time Stamp Data Write
(continued)

Example

This example has defined the Reference Time Stamp as Friday, February 10, 1995. The Hour of 0 indicates a starting time of 10:00am. You can then use this information to track scheduled maintenance down times or other information as desired.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	7	-29952	0	0	0	2566	1283			
	N10:10				00\00	00\00	0A\06	05\02			
BTR Data File	N10:90	0	2816	0							

ASCII Display Values

Time Stamp

Load Clock Info Reference Stamp

The Load Clock Info Reference Stamp message loads the real–time clock data into the reference stamp.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 0	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

Message Length 0	Header Word 1
PLC Decimal Value 2818 — Message OK -29950 — Message Error	Header Word 2
0	Header Word 3

Message Operation

The Load Clock Info Reference Stamp function specified in the BTW sends the real–time clock data to the reference stamp. The reference stamp time then follows the real–time clock data.

Example

In this example, the request to load the real–time clock data into the reference stamp was sent through the BTW. The BTR responded with a message of OK.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	0	0							
BTR Data File	N10:90	0	2818	0							

Trend File
Number of Trends Available

The Number of Trends Available function indicates how many trend files the drive supports.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4096	Header Word 2
0	Header Word 3

Drive Response –– Block Transfer Read

Message Length 3	Header Word 1
PLC Decimal Value 4096 — Message OK –28672 — Message Error	Header Word 2
Trends Available	Header Word 3

Message Operation

You can use the Number of Trends Available function to request the number of trends that the drive supports. This function always returns 4.

Example

In this example, a message was sent to the drive to request the number of trend files available. The drive response indicates that four trend files are available.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4096	0							
BTR Data File	N10:90	3	4096	4							

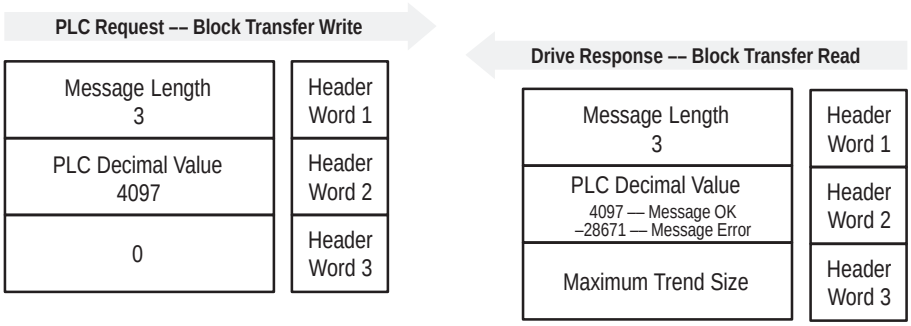
Trend File
Maximum Trend Size Available

The Maximum Trend Size Available function allows you to determine the size of the trend buffer. This function always returns 500.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 3 words

Message Structure



Message Operation

You can use the Maximum Trend Size Available function to determine the size of the trend buffer. This function always returns 500.

Example

In this example, a Maximum Trend Size Available request was sent to the drive. The drive returned a value of 500 in word 3.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4097	0							
BTR Data File	N10:90	3	4097	500							

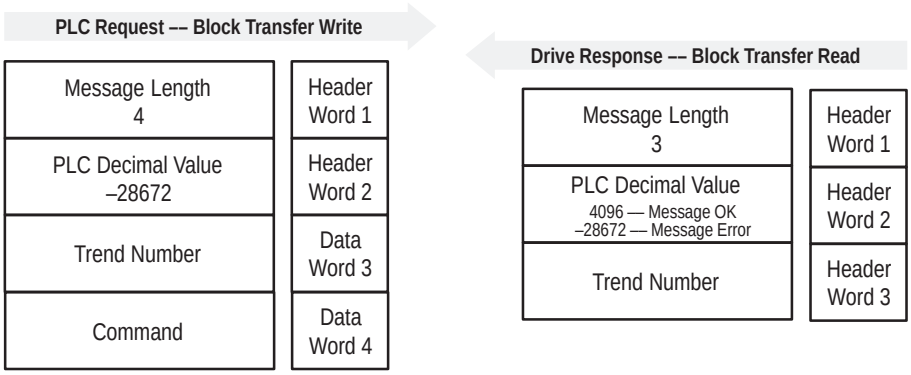
Trend File
Trend Command

The Trend Command function allows you to send a disable trend, enable trend, or force trigger command to the drive for a specific trend operation.

PLC Block Transfer Instruction Data

BTW instruction length: 4 words
BTR instruction length: 3 words

Message Structure



Message Operation

You can use the trend command to send one of the following commands to the drive: disable trend, enable trend, or force trigger. To send a Trend Command function, you need to specify both the trend number and the command number.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

The following are the valid command numbers:

This number:	Sends a command to:
0	Disable the specified trend.
1	Enable the specified trend.
2	Force a trigger for the specified trend.

Trend Command
(continued)

Example

In this example, a disable trend command is sent for trend 4.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	4	–28672	16384	0						
BTR Data File	N10:90	3	4096	0							

Trend File
Trend Status

The Trend Status function allows you to read the status of the specified trend file.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 4 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4097	Header Word 2
Trend Number	Header Word 3

Drive Response –– Block Transfer Read

Message Length 4	Header Word 1
PLC Decimal Value 4097 — Message OK –28671 — Message Error	Header Word 2
Trend Number	Header Word 3
Status	Data Word 4

Message Operation

You can use the Trend Status function to read the status of the trend specified by Trend Number.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

The following are the possible status values that can be returned in word 4:

This number:	Indicates that the trend is:
1	Stopped.
2	Running.
3	In the tripped trigger state. The condition has become true, and the post samples are being taken.
4	In the forced trigger state. The trigger condition was forced to be true so that the post samples could be taken.

Trend Status
(continued)

Example

In this example, a Trend Status message was requested for Trend 2. The drive responded that Trend 2 is in the tripped trigger state.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4097	8192							
BTR Data File	N10:90	4	4097	8192	2						

Trend File
Setup Data Full

The Setup Data Full function allows you to write the trend set up information in a single message.

If the set up data write is successful, it will auto–start the trend.

PLC Block Transfer Instruction Data

BTW instruction length: 15 words
BTR instruction length: 3 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 15	Header Word 1
PLC Decimal Value –28670	Header Word 2
Trend Number	Header Word 3
Trend Status	Data Word 4
Trend Sample Size	Data Word 5
Post Samples	Data Word 6
Operator Data	Data Word 7
Sample Time Rate	Data Word 8
Mode	Data Word 9
Comparison A Value	Data Word 10
Comparison A Link	Data Word 11
Comparison B Value	Data Word 12
Comparison B Link	Data Word 13
Sampling Input Parameter	Data Word 14
Trend Output Parameter	Data Word 15

Drive Response –– Block Transfer Read

Message Length 3	Header Word 1
PLC Decimal Value 4098 — Message OK –28670 — Message Error	Header Word 2
Trend Number	Header Word 3

Setup Data Full
(continued)

Message Operation

You can use the Setup Data Full function to load the set up information for a trend file in a single message, instead of loading the individual parameters within the drive.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

Trend Status is ignored.

Trend Sample Size is ignored.

Post Samples specifies the number of samples that are taken once the trigger condition has been tripped or is forced. One sample is used for the instance when the trigger becomes true.

Operator data specifies how to compare the two data values for the trigger condition.

Sample Time Rate specifies the rate of sampling data value. An entry of 1 specifies 2 milliseconds.

Mode specifies whether a continuous trend or a one–shot trend is performed.

If Comparison A Value is non–zero, the value specifies a constant value to use as Operand X. You need to specify the Comparison A Value in internal drive units. If Comparison A Value is zero, Operand X is specified by Comparison A Link.

If Comparison A Link is non–zero, the value specifies the source parameter that is linked to the trend operand. If Comparison A Link is zero, Operand X is specified by Comparison A Value.

If Comparison B Value is non–zero, the value specifies a constant value to use as Operand Y. You need to specify the Comparison B Value in internal drive units. If Comparison B Value is zero, Operand Y is specified by Comparison B Link.

If Comparison B Link is non–zero, the value specifies the source parameter that is linked to the trend operand. If Comparison B Link is zero, Operand Y is specified by Comparison B Value.

Sampling Input Parameter specifies the source parameter number that is linked to the Trend Input parameter.

Setup Data Full
(continued)

Trend Output Parameter specifies the sink parameter number that the Trend Output parameter is linked to.

Example

In this example, a Trend 1 is set up to sample Velocity Feedback (parameter number 101). The trend triggers when Velocity Feedback is greater than 1750 rpm (an internal constant of 4096). When the trigger condition is true, 400 more samples are taken (at a rate of 12 milliseconds each) before the trend stops. The output data is then transferred to Analog Output 1 after the trend stops.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	15	–28670	4096	0	0	400	1	6	0	0
	N10:20	101	4096	0	101	387					
BTR Data File	N10:90	3	4098	4096							

Trend File
All Info

The All Info function allows you to read the set up information for a trend file in a single message instead of reading the individual parameters within the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 15 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4098	Header Word 2
Trend Number	Header Word 3

Drive Response –– Block Transfer Read

Message Length 15	Header Word 1
PLC Decimal Value 4098 — Message OK –28670 — Message Error	Header Word 2
Trend Number	Header Word 3
Trend Status	Data Word 4
Trend Sample Size	Data Word 5
Post Samples	Data Word 6
Operator Data	Data Word 7
Sample Time Rate	Data Word 8
Mode	Data Word 9
Comparison A Value	Data Word 10
Comparison A Link	Data Word 11
Comparison B Value	Data Word 12
Comparison B Link	Data Word 13
Sampling Input Parameter	Data Word 14
Trend Output Parameter	Data Word 15

All Info
(continued)

Message Operation

You can use the All Info function to read the set up information for a trend file in one message as opposed to the individual parameters within the drive.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

The following are the possible status values:

This number:	Indicates that the trend is:
1	Stopped.
2	Running.
3	In the tripped trigger state. The condition has become true, and the post samples are being taken.
4	In the forced trigger state. The trigger condition was forced to be true so that the post samples could be taken.

Trend Sample Size is always 500.

Post Samples specifies the number of samples that are taken once the trigger condition has been tripped or is forced. One sample is used for the instance when the trigger becomes true.

Operator data specifies how to compare the two data values for the trigger condition.

Sample Time Rate specifies the rate of sampling data value. An entry of 1 specifies 2 milliseconds.

Mode specifies whether a continuous trend or a one–shot trend is performed.

If Comparison A Value is non–zero, the value specifies a constant value to use as Operand X. You need to specify the Comparison A Value in internal drive units. If Comparison A Value is zero, Operand X is specified by Comparison A Link.

All Info
(continued)

If Comparison A Link is non–zero, the value specifies the source parameter that is linked to the trend operand. If Comparison A Link is zero, Operand X is specified by Comparison A Value.

If Comparison B Value is non–zero, the value specifies a constant value to use as Operand Y. You need to specify the Comparison B Value in internal drive units. If Comparison B Value is zero, Operand Y is specified by Comparison B Link.

If Comparison B Link is non–zero, the value specifies the source parameter that is linked to the trend operand. If Comparison B Link is zero, Operand Y is specified by Comparison B Value.

Sampling Input Parameter specifies the source parameter number that is linked to the Trend Input parameter.

Trend Output Parameter specifies the sink parameter number that the Trend Output parameter is linked to.

Example

In this example, the information for Trend 1 is read.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4098	4096							
BTR Data File	N10:90	15	4098	4096	0	500	400	1	6	0	0
	N10:100	101	4096	0	101	387					

Trend File
Trigger Time

The Trigger Time function allows you to read the trigger time for the specified trend file from the drive.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 7 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4099	Header Word 2
Trend Number	Header Word 3

Drive Response –– Block Transfer Read

Message Length 7	Header Word 1
PLC Decimal Value 4099 — Message OK –28669 — Message Error	Header Word 2
Trend Number	Header Word 3
Clock Time: Seconds | 10ths of MS	Data Word 4
Clock Time: Hour | Minute	Data Word 5
Clock Time: Date | Day	Data Word 6
Clock Time: Year | Month	Data Word 7

Message Operation

You can use the Trigger Time function to read the trigger time for the specified trend file from the drive.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

Trigger Time
(continued)

The time is based on a 24–hour clock.

This field:	Indicates:
Seconds	The seconds (high byte) and tenths of milliseconds (low byte). The seconds can be 0 through 59, and the tenths of milliseconds can be 0 through 99.
Hour	The hour (high byte). Valid values are 0 through 23.
Minute	The number of minutes passed the hour (low byte). Valid values are 0 through 59.
Date	The date of the month (high byte). Valid values are 1 through 31.
Day	The day of the week (low byte), where 1 is Sunday and 7 is Saturday.
Year	The number of the year (high byte). 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5. Valid values are 0 through 99.
Month	The month of the year (low byte), where 1 is January and 12 is December.

If the trend does not trigger and you send this request, the PLC Communications Adapter Board returns the time when the drive first powered up.

Example

In this example, the trend triggered on Tuesday, October 17, 1995 at 10:49.22.74 am.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4099	4096							
BTR Data File	N10:90	7	4099	4096	22 74	10 49	17 03	05 10			

Trend File
Run File Data

The Run File Data function allows you to read the run–time data buffer within the drive for the specified trend file.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 35 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4100	Header Word 2
Trend Number / Offset (Bits 0 –11)	Header Word 3

Drive Response –– Block Transfer Read

Message Length 35	Header Word 1
PLC Decimal Value 4100 — Message OK –28668 — Message Error	Header Word 2
Trend Number	Header Word 3
Data Sample 1	Data Word 4
Data Sample 2	Data Word 5
• • •	• • •
• • •	• • •
Data Sample 31	Data Word 34
Data Sample 32	Data Word 35

Message Operation

The Run File Data function reads the run–time buffer within the drive for the specified trend file. This buffer is continually being refreshed with new data when the trend is in the running state. Until the trend is triggered, the data is placed in the stored data file. You can use the Run File Data function to monitor data on–line. You can read 32 data samples from the data sample pointed to by the offset.

To use the Run File Data function, you need to specify the trend number in bits 12 through 15 and the offset into the buffer in bits 0 through 11 of the word 3 of the BTW. Therefore, you need to add the offset value to the trend number.

Run File Data
(continued)

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

The offset specifies where in the buffer you want to start reading the 32 data points. For example, if you specify an offset of 64, the Run File Data function returns the 32 data samples starting from data sample 64.

If you specify an offset of zero, then the BTR message has the following format:

Drive Response –– Block Transfer Read

Message Length 35	Header Word 1
PLC Decimal Value 4100 — Message OK –28668 — Message Error	Header Word 2
Trend Number	Header Word 3
Index	Data Word 4
Timestamp 2ms Ticks	Data Word 5
Timestamp Seconds	Data Word 6
Timestamp Minutes	Data Word 7
Timestamp Hours	Data Word 8
Data Sample 1	Data Word 9
Data Sample 2	Data Word 10
• • •	• • •
• • •	• • •
Data Sample 26	Data Word 34
Data Sample 27	Data Word 35

Run File Data
(continued)

Index indicates the index into the 500 word buffer where the last data point was written.

Timestamp is updated when the last (500th) data point is written. The time stamp has the following format:

This field:	Indicates:
Ticks	The number of ticks. One tick equals two milliseconds. Valid values are 0 through 499.
Seconds	The number of seconds. Valid values are 0 through 59.
Minute	The number of minutes passed the hour. Valid values are 0 through 59.
Hour	The hour. Valid values are 0 through 23.

If you request less than 32 trend samples, then run–time data is padded with zeros. If you request data samples past the end of the buffer, then run–time data is padded with zeros.

Important: The data samples that you are reading are not being read from the trend file. Instead, the data samples are read from the running trend buffer. This buffer is continually changing at the rate specified by the sampling rate for that particular trend. You should use this function when you want to monitor the current trend sampling.

Example

In this example, Trend 1 is sampling the Velocity Feedback as it is hovering around 1750 rpm. The data is displayed in internal drive units.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4100	4128							
BTR Data File	N10:90	35	4100	4128	4093	4092	4093	4092	4091	4094	4093
	N10:100	4092	4091	4092	4091	4091	4092	4093	4094	4094	4093
	N10:110	4092	4091	4093	4094	4092					

Trend File
Stored File Data

The Stored File Data function allows you to read the data values in the stored data file buffer when the trigger condition occurs.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 35 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3		Header Word 1
PLC Decimal Value 4101		Header Word 2
Trend Number	Offset (Bits 0 –11)	Header Word 3

Drive Response –– Block Transfer Read

Message Length 35	Header Word 1
PLC Decimal Value 4101 — Message OK –28667 — Message Error	Header Word 2
Trend Number	Header Word 3
Data Sample 1	Data Word 4
Data Sample 2	Data Word 5
• • •	• • •
• • •	• • •
Data Sample 31	Data Word 34
Data Sample 32	Data Word 35

Message Operation

You can use the Stored File Data function to read the data points in the stored buffer within the drive for the specified trend file.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

Stored File Data
(continued)

The offset specifies where in the buffer you want to start reading the 32 data points. For example, if you specify an offset of 64, the Run File Data function returns the 32 data samples starting from data sample 64.

If you request less than 32 trend samples, then the file data is padded with zeros. If you request data samples past the end of the buffer, then the file data is padded with zeros.

This data is read from the triggered trend file. Once the buffer is filled based on the post sample number, no more data is stored and the file does not change.

Example

In this example, Trend 1 has tripped and the message request gets the data around the trigger condition.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4101	4191							
BTR Data File	N10:90	35	4101	4191	4092	4091	4094	4091	4097	4096	4098
	N10:100	4099	4100	4099	4101	4102	4100	4099	4098	4100	4101
	N10:110	4101	4102	4101	4099	4097	4095	4097	4100	4100	4099
	N10:120	4101	4102	4100	4099	4100					

Trend File
Trend Parameter Definition

The Trend Parameter Definition allows you to read the list of trend parameter numbers from the database.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 13 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4102	Header Word 2
Trend Number	Header Word 3

Drive Response –– Block Transfer Read

Message Length 13	Header Word 1
PLC Decimal Value 4102 — Message OK –28666 — Message Error	Header Word 2
Trend Number	Header Word 3
Trend Status Parameter Number	Data Word 4
Trend Sample Size Parameter Number	Data Word 5
Post Samples Parameter Number	Data Word 6
Operator Data Parameter Number	Data Word 7
Sample Time Rate Parameter Number	Data Word 8
Mode Parameter Number	Data Word 9
Comparison A Parameter Number	Data Word 10
Comparison B Parameter Number	Data Word 11
Sampling Input Parameter Number	Data Word 12
Trend Output Parameter Number	Data Word 13

Message Operation

You can use the Trend Parameter Definition function to read the list of trend parameter numbers from the database. You can set up trends using the Trend Setup Data File message or by direct access through the parameter mechanism.

Trend Parameter Definition
(continued)

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

Example

In this example, the parameter numbers for Trend 3 are read.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4102	12228							
BTR Data File	N10:90	13	4102	12228	482	453	479	477	478	480	475
	N10:100	476	474	483							

Trend File

Trend Triggered Setup Parameter Values

The Trend Triggered Setup Parameter Values function allows you to read the trend set up data for the stored data file.

PLC Block Transfer Instruction Data

BTW instruction length: 3 words
BTR instruction length: 16 words

Message Structure

PLC Request –– Block Transfer Write

Message Length 3	Header Word 1
PLC Decimal Value 4103	Header Word 2
Trend Number	Header Word 3

Drive Response –– Block Transfer Read

Message Length 16	Header Word 1
PLC Decimal Value 4103 — Message OK –28665 — Message Error	Header Word 2
Trend Number	Header Word 3
Trend Sample Size	Data Word 4
Post Samples	Data Word 5
Operator	Data Word 6
Sample Time Rate	Data Word 7
Comparison A Value	Data Word 8
Comparison A Link	Data Word 9
Comparison B Value	Data Word 10
Comparison B Link	Data Word 11
Sampling Input Link	Data Word 12
Clock Time Seconds | 10ths of MS	Data Word 13
Clock Time Hour | Minute	Data Word 14
Clock Time Date | Day	Data Word 15
Clock Time Year | Month	Data Word 16

Trend Triggered Setup Parameter Values
(continued)

Message Operation

You can use the Trend Triggered Setup Parameter Values function to read the list of trend set up data for the stored data file.

The following are the valid trend numbers:

This number:	Specifies that the command is to be sent for:
4096	Trend 1
8192	Trend 2
12228	Trend 3
16384	Trend 4

The time is based on a 24–hour clock.

This field:	Indicates:
Seconds	The seconds (high byte) and tenths of milliseconds (low byte). The seconds can be between 0 and 59, and the milliseconds can be between 0 and 99.
Minute	The number of minutes passed the hour (low byte). Valid values are 0 through 59.
Hour	The hour (high byte). Valid values are 0 through 23.
Date	The date of the month (high byte). Valid values are 1 through 31.
Day	The day of the week (low byte), where 1 is Sunday and 7 is Saturday.
Year	The number of the year (high byte). 1990 is referenced as 0. Therefore, the year 1995 would return a value of 5. Valid values are 0 through 99.
Month	The month of the year (low byte), where 1 is January and 12 is December.

Trend Triggered Setup Parameter Values
(continued)

Example

In this example, velocity feedback exceeds 1750 rpm (4096 in internal units) on October 17, 1995 at 2:28.33.17 pm.

Data Format

		0	1	2	3	4	5	6	7	8	9
BTW Data File	N10:10	3	4103	4096							
BTR Data File	N10:90	16	4103	4096	500	400	1	6	0	101	4096
	N10:100	0	101	33 17	28 14	03 17	10 05				

Troubleshooting

Chapter Objectives

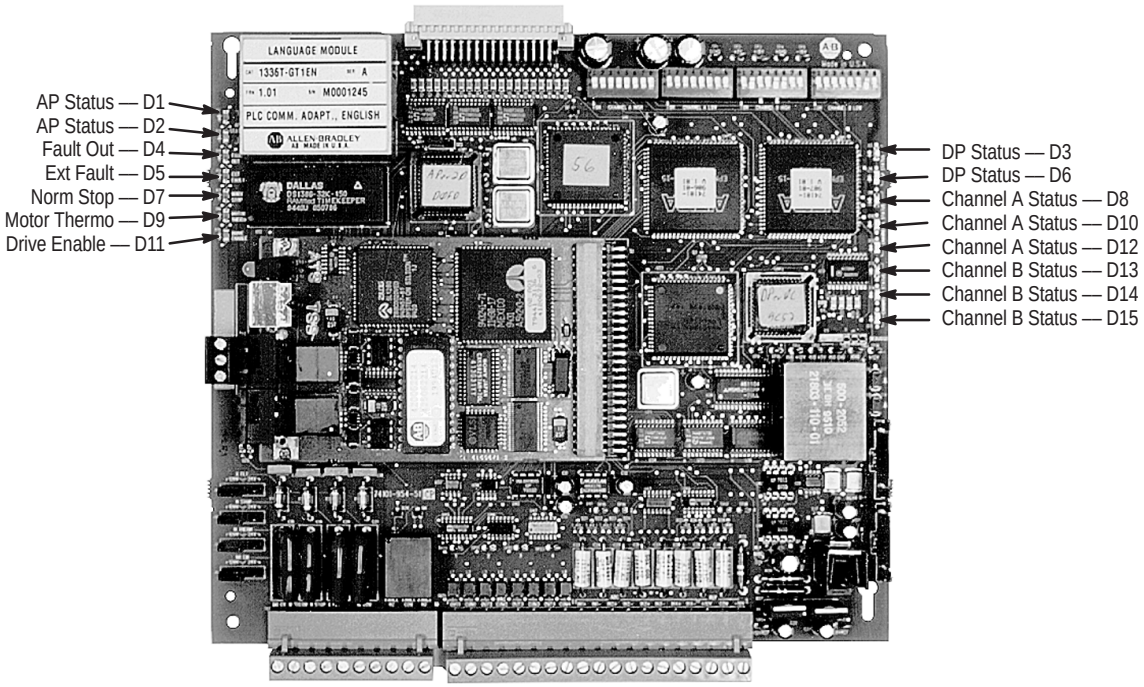
Chapter 8 provides information to help you in trouble shooting the PLC Communications Adapter Board. This chapter describes:

- the fault and status LEDs
- the fault queues
- the fault types
- the fault codes

ATTENTION: Only qualified personnel familiar with the 1336 FORCE drive system and associated machinery should perform troubleshooting or maintenance functions on the drive. Failure to comply may result in personnel injury and/or equipment damage.

Fault and Status LEDs

The following shows the fifteen status and fault LEDs that are located on the PLC Communications Adapter Board to provide a visual indication of board operation. The PLC Communications Adapter Board is a non–serviceable device. If you did not properly configure the PLC Communications Adapter Board, the board will indicate faults and/or hardware malfunctions. You should verify the system configuration before checking for faults or hardware malfunctions.



Application Processor (AP) Status D1 and D2

These LEDs reflect the operational status of the application processor.

LED:	State:	Function:
D1 (Red)	LED on	AP hard fault
	LED off	D6 on or hardware malfunction
	LED blinking	AP soft fault
D2 (Green)	LED on	Normal AP operation
	LED off	D3 on or hardware malfunction
	LED blinking	AP warning

Domino Processor (DP) Status D3 and D6

These LEDs reflect the operational status of the Domino processor.

LED:	State:	Function:
D3 (Red)	LED on	DP hard fault
	LED off	D6 on or hardware malfunction
	LED blinking	DP soft fault
D6 (Green)	LED on	Normal DP operation
	LED off	D3 on or hardware malfunction
	LED blinking	DP warning

PLC Communications Adapter Status D4, D5, D7, D9, and D11

These LEDs reflect the operational status of the drive permissives.

LED:	State:	Function:
D4 (Red)	LED on	System fault present
	LED off	System fault not present
D5 (Red)	LED on	External fault present
	LED off	External fault not present
D7 (Red)	LED on	Normal drive stop signal present
	LED off	Normal drive stop signal not present
D9 (Red)	LED on	Motor thermoguard open
	LED off	Motor thermoguard closed
D11 (Green)	LED on	Drive enable signal present
	LED off	Drive disabled

Channel A Status D8, D10, and D12
Channel B Status D13, D14, and D15

These LEDs reflect the operational status of either RIO or DH+ communications.

LED:	State:	RIO Adapter Function:	RIO Scanner Function:	DH+ Function:
D8 and D13 (Red)	LED on	Hardware malfunction	Hardware malfunction	Domino plug malfunction
	LED off	Communications loss or D12 and D15 on.	None	None
	LED blinking	A PLC or RIO scanner has the rack inhibited or the PLC is in Reset/ Program/Test mode	All devices in the scan list are faulted	Duplicate node on DH+ link
D10 and D14 (Yellow)	LED on	None	None	Normal DH+ communications
	LED off	None	None	PLC Communications Adapter Board faulted
	LED blinking	None	None	No communications over DH+
D12 and D15 (Green)	LED on	Normal PLC controller communications	All devices in the scan list are operational	None
	LED off	No communications to PLC control or D8 and D13 on	No communications to PLC control or D8 and D13 on	None
	LED blinking	PLC in Reset/Program/ Test mode or PLC has rack inhibited	At least one device on the scan list is faulted. For example, if you turn one half rack off, this light blinks.	None

Fault Queues

All faults that have occurred are shown in the fault queue. Each entry shows the type of fault and the time and date that the fault occurred. The fault information stays in BRAM until you clear the queue by using the Clear Fault Queue command. You cannot clear the queue by issuing either a Clear Fault or a Drive Reset command or by recycling the drive power.

The fault queue may contain up to 32 faults. The following information is provided for each fault listed in the fault queue:

- a fault queue entry number to indicate the position of the fault in the fault queue
- a trip point (TP) to indicate which entry in the fault queue caused the drive to trip (all faults which are displayed in the queue before the TP fault occurred after the TP was logged)
- a five character decimal numbered fault code, which is described later in this chapter
- the time and date when the fault occurred
- descriptive fault text plus all clear fault commands and when they were executed

Faults

The 1336 FORCE monitors both internal and external operating conditions, responding to conditions that you program as being incorrect. Most malfunctions that occur will induce one of three types of faults.

Hard Faults

Hard faults indicate that the 1336 FORCE has detected a malfunction where internal recovery is not possible. Hard faults are the most severe type of faults. Hard faults indicate that a major internal component or system has malfunctioned and that drive functions may be lost. To recover from a hard fault, you must either issue a Drive Reset command or recycle the drive power.

Soft Faults

Soft faults exist to protect drive system components from internal and external malfunctions. Unlike hard faults, in most instances, you can maintain drive control when a soft fault occurs. Soft faults indicate that the 1336 FORCE has detected a malfunction that could damage drive control, power components, or the motor. Soft faults may also indicate undesirable external operating conditions. You can recover by issuing a Clear Fault command, a Clear Fault Queue command, a Drive Reset command, or by recycling the drive power.

Warning Faults

A warning fault has the lowest priority of all types of faults. A warning fault indicates a condition that if left uncorrected could result in a soft fault and is designed to annunciate a condition present in the system. When a warning fault occurs, the drive is not commanded to stop. Drive operation is not affected, but a fault code is entered into the fault queue reflecting the condition. You can recover by initiating a Clear Fault command, but this is not necessary for continued operation.

Configurable Faults

By using parameter programming, you can configure whether certain faults are reported as a soft fault, a warning fault, or no fault when the fault condition is present. You can use parameters 425, 426, 430, and 431 to configure the faults when you are using RIO communications. If you want the PLC Communications Adapter Board to report the fault condition as a soft fault, you need to set the appropriate bit in parameter 425 for channel A or parameter 430 for channel B. To have the PLC Communications Adapter Board report the fault condition as a warning, you need to set the appropriate bit in parameter 426 for channel A or parameter 431 for channel B and make sure that the corresponding bit is not set in parameter 425 or 430.

When a fault condition that is specific to RIO communications occurs, the PLC Communications Adapter Board first checks parameter 425 or 430. If the bit representing the fault condition is set, the condition is reported as a soft fault. If the bit is not set, the PLC Communications Adapter Board then checks parameter 426 or 431. If the corresponding bit is set in 426 or 431 but not set in parameter 425 or 430, the condition is reported as a warning. If the bit is not set in either parameter, the PLC Communications Adapter Board does not report the condition and drive operation continues unaffected.

Fault Code Descriptions

PLC Communications Adapter Board fault and warning codes are five character decimal numbers that have the following format:

S	A	X	X	X

S

Source Designator
0 = Main Board Velocity Processor
1 = Main Board Current Processor
2 = Adapter Processor
3 = PLC Interface Board Processor
4 = Reserved
5 = Reserved

A

Area Designator
0 = General
1 = Motor
2 = Inverter
3 =Motor Control
4 = Reserved Adapter
5 = External Device
6 = Communications
7 = Reserved
8 = Reserved
9 = Converter/Brake

XXX

Internal Fault Code

Fault Displays

Both HIM and GPT LCD displays indicate a fault or warning by showing the adapter code and fault text. Fault text may be up to 16 characters in length.

The following are the fault codes.

Fault text and code:	Fault type:	Description:	Suggested action:
Faults Cleared 24000	None	This entry in the fault or warning queue is displayed when you request a clear fault command.	None
Adpt BRAM Cksm 24009	Soft	There is a discrepancy between the calculated checksum and the saved checksum for the adapter data.	Reset the drive. If the fault persists: 1. Execute a BRAM recall. 2. Execute a BRAM store. 3. Reset the drive. 4. Clear the faults. When you are done with these steps, verify all parameter values.

Fault text and code:	Fault type:	Description:	Suggested action:
Drv Types Differ 24010	Soft	There is a discrepancy between the drive type on the base driver board and the parameter 220 and 221 values in BRAM.	Reset the drive. If the fault persists: 1. Execute a BRAM recall. 2. Execute a BRAM store. 3. Reset the drive. 4. Clear the faults. When you are done with these steps, verify all parameter values.
I11 Drive Type 24011	Hard	The drive type code in Serial E2 on the base driver board is not a valid code per the language module table.	Replace the base driver board.
Main BRAM Cksm 24012	Soft	There is a discrepancy between the calculated checksum and the saved checksum for the main control board.	Reset the drive. If the fault persists: 1. Execute a BRAM recall. 2. Execute a BRAM store. 3. Reset the drive. 4. Clear the faults. When you are done with these steps, verify all parameter values.
SW Malfunction 24013	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, you may have to replace either the PLC Communications Adapter Board or the main control board.
SW Malfunction 24014	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, you may have to replace either the PLC Communications Adapter Board or the main control board.
SW Malfunction 24015	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
SW Malfunction 24016	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
SW Malfunction 24017	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
SW Malfunction 24018	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
AP SW/LM Rev Err 24025	Soft	There is a PLC Communications Adapter Board software/language module mismatch.	Verify the board software and language module versions with Allen–Bradley.

Fault text and code:	Fault type:	Description:	Suggested action:
Adapter Config Err 24026	Soft	The PLC Communications Adapter Board has detected that board DIP switch settings do not match values stored in BRAM.	Verify the DIP switch settings and execute a BRAM store to save the new settings.
No AP LM Exists 25023	Hard	The PLC Communications Adapter Board has detected that a language module has not been installed on the PLC Communications Adapter Board.	Reset the drive. If the fault persists, replace the language module.
SP Pt1 Timeout 26038	Soft, warning, or none	The device connected to Port 1 of SCANport has been disconnected.	None
SP Pt2 Timeout 26039	Soft, warning, or none	The device connected to Port 2 of SCANport has been disconnected.	None
SP Pt3 Timeout 26040	Soft, warning, or none	The device connected to Port 3 of SCANport has been disconnected.	None
SP Pt4 Timeout 26041	Soft, warning, or none	The device connected to Port 4 of SCANport has been disconnected.	None
SP Pt5 Timeout 26042	Soft, warning, or none	The device connected to Port 5 of SCANport has been disconnected.	None
SP Comm Fault 26043	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
SP Offline 26057	Soft, warning, or none	Excessive Communication errors.	Check SCANport connection/cables. Replace terminal. If fault persists, replace PLC. Comm Adapter Brd.
HW Malfunction 34001	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
HW Malfunction 34002	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
HW Malfunction 34003	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
HW Malfunction 34004	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.

Fault text and code:	Fault type:	Description:	Suggested action:
HW Malfunction 34005	Hard	The integrity check on the board hardware has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
ChA Rack Config 34006	Hard	The DIP switch settings indicate that more than one full rack should be scanned. This fault is specific to RIO scanner.	Verify the DIP switch settings for channel A. RIO scanner can only scan one full logical rack per channel.
ChB Rack Config 34007	Hard	The DIP switch settings indicate that more than one full rack should be scanned. This fault is specific to RIO scanner.	Verify the DIP switch settings for channel B. RIO scanner can only scan one full logical rack per channel.
ChA Module Group 34012	Hard	The PLC Communications Adapter Board has detected a channel A module group that is not valid for the selected rack size.	Check parameter 303 (DIP switch ChA) and verify the DIP switch settings: **Channel A High** **sw3** **sw4** Module 0 Off Off Module 2 Off On Module 4 On Off Module 6 On On Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
ChB Module Group 34013	Hard	The PLC Communications Adapter Board has detected a channel B module group that is not valid for the selected rack size.	Check parameter 304 (DIP switch ChB) and verify the DIP switch settings: **Channel B High** **sw3** **sw4** Module 0 Off Off Module 2 Off On Module 4 On Off Module 6 On On Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.

Fault text and code:	Fault type:	Description:	Suggested action:
Redund Rack Size 34014	Hard	The PLC Communications Adapter Board has detected different rack sizes for channels A and B when RIO with redundancy was selected.	Check parameters 303 and 304 (DIP Switch ChA and DIP Switch ChB). Verify the DIP switch settings. Both channels must have the same rack size. **Channels A/B LOW** **sw5** **sw6** 1/4 rack Off Off 1/2 rack Off On 3/4 rack On Off Full rack On On **Note:** Full racks can only have the Last/Not Last switch set to Off. Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
Redund Diff Prot 34015	Hard	The PLC Communications Adapter Board has detected redundant operation has been called for, but channel A is not configured for the RIO protocol.	Check parameters 303 and 304 (DIP Switch ChA and DIP Switch ChB). Verify the DIP switch settings. Both channels must be configured for the RIO protocol when using the redundant mode. **Channel A LOW** **sw8** Non–redundant Off Redundant On **Channel B LOW** **sw1** **sw2** RIO w/o Blk Trans Off Off RIO w/ Blk Trans Off On DH+ On Off RIO scanner On On If the fault persists, replace the PLC Communications Adapter Board.
SW Malfunction 34016	Hard	The integrity check on the board software has failed.	Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
ChA Dup Nodeaddr 36019	Soft	The PLC Communications Adapter Board has detected a duplicate channel A DH+ node address.	Check parameter 303 (DIP Switch ChA) and refer to the table in Chapter 2 to verify the DIP switch settings. Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.

Fault text and code:	Fault type:	Description:	Suggested action:
ChB Dup Nodeaddr 36020	Soft	The PLC Communications Adapter Board has detected a duplicate channel B DH+ node address.	Check parameter 304 (DIP Switch ChB) and refer to the table in Chapter 2 to verify the DIP switch settings. Reset the drive. If the fault persists, replace the PLC Communications Adapter Board.
ChA Comm Loss 36021	Soft, warning, or none	The PLC Communications Adapter Board has detected a loss of channel A communications with the PLC controller.	Check for a break in the communications cable. Verify that all connections are intact. Clear the fault by issuing a Clear Fault or a Drive Reset command, or by recycling power. Check parameters 425 (ChA RIO Flt Sel) and 426 (ChA RIO Warn Sel) to determine the drive response to faults. These parameters determine the resolution of the condition, either fault, warning, or none. Both parameters are bit coded. • Bit 0 determines the resolution to ChA Res/Pgm/Test. If bit 0 is set in parameter 425, a soft fault is logged. If bit 0 is reset in 425 and bit 0 in parameter 426 is set, a warning fault is logged. If bit 0 is reset in 425 and 426, no action is taken. • Bit 1 determines the data output status of a fault. If set to 0, zeros are transmitted. If set to 1, the last state is transmitted. Check parameter 436 (ChA Flt Sts). Bit 1=1 indicates a fault if configured to do so in parameter 425 (ChA RIO Flt Sel). Check parameter 437 (ChA Warn Sts). Bit 1=1 indicates a fault if configured to do so in parameter 426 (ChA RIO Warn Sel).

Fault text and code:	Fault type:	Description:	Suggested action:
ChB Comm Loss 36022	Soft, warning, or none	The PLC Communications Adapter Board has detected a loss of channel B communications with the PLC controller.	Check for a break in the communications cable. Verify that all connections are intact. Clear the fault by issuing a Clear Fault or a Drive Reset command, or by recycling power. Check parameters 430 (ChB RIO Flt Sel) and 431 (ChB RIO Warn Sel) to determine the drive response to faults. These parameters determine the resolution of the condition, either fault, warning, or none. Both parameters are bit coded. • Bit 0 determines the resolution to ChB Res/Pgm/Test. If bit 0 is set in parameter 430, a soft fault is logged. If bit 0 is reset in 425 and bit 0 in parameter 431 is set, a warning fault is logged. If bit 0 is reset in 430 and 431, no action is taken. • Bit 1 determines the data output status of a fault. If set to 0, zeros are transmitted. If set to 1, the last state is transmitted. Check parameter 438 (ChB Flt Sts). Bit 1=1 indicates a fault if configured to do so in parameter 430 (ChB RIO Flt Sel). Check parameter 439 (ChB Warn Sts). Bit 1=1 indicates a fault if configured to do so in parameter 431 (ChB RIO Warn Sel).

Fault text and code:	Fault type:	Description:	Suggested action:
ChA Res/Pgm/Test 36023	Soft, warning, or none	The PLC Communications Adapter Board has detected the PLC controller being switched from the run mode to another mode.	Check the PLC mode switch and the I/O control reset. Clear the fault by issuing a Clear Fault or a Drive Reset command, or by recycling the power. Check parameters 425 (ChA RIO Flt Sel) and 426 (ChA RIO Warn Sel) to determine the drive response to faults. These parameters determine the resolution of the condition, either fault, warning, or none. Both parameters are bit coded. • Bit 0 determines the resolution to ChA Res/Pgm/Test. If bit 0 is set in parameter 425, a soft fault is logged. If bit 0 is reset in 425 and bit 0 in parameter 426 is set, a warning fault is logged. If bit 0 is reset in 425 and 426, no action is taken. • Bit 1 determines the data output status of a fault. If set to 0, zeros are transmitted. If set to 1, the last state is transmitted. Check parameter 436 (ChA Flt Sts). Bit 0=1 indicates a fault if configured to do so in Parameter 425 (ChA RIO Flt Sel). Check parameter 437 (ChA Warn Sts). Bit 0=1 indicates a fault if configured to do so in parameter 426 (ChA RIO Warn Sel).

Fault text and code:	Fault type:	Description:	Suggested action:
ChB Res/Pgm/Test 36024	Soft, warning, or none	The PLC Communications Adapter Board has detected the PLC controller being switched from the run mode to another mode.	Check the PLC mode switch and the I/O control reset. Clear the fault by issuing a Clear Fault or a Drive Reset command, or by recycling the power. Check parameters 430 (ChB RIO Flt Sel) and 431 (ChB RIO Warn Sel) to determine the drive response to faults. These parameters determine the resolution of the condition, either fault, warning, or none. Both parameters are bit coded. • Bit 0 determines the resolution to ChB Res/Pgm/Test. If bit 0 is set in parameter 430, a soft fault is logged. If bit 0 is reset in 430 and bit 0 in parameter 431 is set, a warning fault is logged. If bit 0 is reset in 430 and 431, no action is taken. • Bit 1 determines the data output status of a fault. If set to 0, zeros are transmitted. If set to 1, the last state is transmitted. Check parameter 438 (ChB Flt Sts). Bit 0=1 indicates a fault if configured to do so in Parameter 430 (ChB RIO Flt Sel). Check parameter 439 (ChB Warn Sts). Bit 0=1 indicates a fault if configured to do so in parameter 431 (ChB RIO Warn Sel).
ChA Rack Fault 36025	Soft, warning, or none	The PLC Communications Adapter Board has detected that the PLC controller either has its rack number (rack address) inhibited, or is no longer scanning the rack.	Check if the PLC has its rack inhibited. Check if the PLC is scanning the rack. Check the rack address on the PLC Communications Adapter Board. Refer to the table in Chapter 2 to verify the DIP switch settings.
ChB Rack Fault 36026	Soft, warning, or none	The PLC Communications Adapter Board has detected that the PLC controller either has its rack number (rack address) inhibited, or is no longer scanning the rack.	Check if the PLC has its rack inhibited. Check if the PLC is scanning the rack. Check the rack address on the PLC Communications Adapter Board. Refer to the table in Chapter 2 to verify the DIP switch settings.

Fault text and code:	Fault type:	Description:	Suggested action:
ChA G0 Rack Flt 36027	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 0, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChA G2 Rack Flt 36028	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 2, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChA G4 Rack Flt 36029	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 4, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChA G6 Rack Flt 36030	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 6, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChB G0 Rack Flt 36031	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 0, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChB G2 Rack Flt 36032	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 2, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChB G4 Rack Flt 36033	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 4, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.
ChB G6 Rack Flt 36034	Soft, warning, or none	The DIP switches indicate that a rack should be scanned at module group 6, but no rack is being scanned at that module group.	Check cables for connections. Check if the rack is inhibited. Check if power is applied to the RIO adapter channel.

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Using the Trend Features

Chapter Objectives

Chapter 9 provides information that can help you use trends. This chapter covers the following topics:

- using trend parameters
- understanding how trending works
- setting up the trigger point
- adjusting the data sample rate
- setting the number of post samples
- setting the buffer type
- forcing a trigger condition
- using cascading trends
- looking at the results of the trend
- looking at trend examples

Trending is a diagnostic tool that you can use to capture and retain an input parameter data value (such as velocity feedback) until a trigger condition (drive fault or malfunction condition) halts or suspends sampling. With trending, you can program the parameter to sample, the trigger condition, the rate of sampling, and the number of post samples taken once the trigger is true.

Using Trend Parameters

The PLC Communications Adapter Board contains four trend buffers that you can set up to monitor any parameter. Each buffer can store up to 500 data points.

Parameters 454 through 493 are associated with trending:

Parameter number:	Parameter name①:	Specifies:
454, 464, 474, 484	Trend Input	The data value to sample at the specified trend sample rate. You should link this parameter to the parameter that is to be sampled.
455, 465, 475, 485	Trend Operand Parameter X (Operand X)	The first half of the trend trigger evaluation. This parameter is generally linked to another parameter.
456, 466, 476, 486	Trend Operand Parameter Y (Operand Y)	The second half of the trend trigger evaluation. This parameter can either be a constant value or linked to another parameter.
457, 467, 477, 487	Trend Operator	The operator used for the trend trigger evaluation, which compares Operand X to Operand Y.
458, 468, 478, 488	Trend Sample Rate	The interval at which the data in the Trend Input parameter is sampled.
459, 469, 479, 489	Trend Post Samples	The number of data samples for the Trend Input parameter to gather once the trigger evaluation becomes true.
460, 470, 480, 490	Trend Continuous Trigger	Whether a single trend operation (one–shot) or a continuous trend operation is performed.
461, 471, 481, 491	Trend Select	The trend mode to use. The trend mode may be enable a trend, disable a trend, or force a trigger condition
462, 472, 482, 492	Trend Status	Which state the trend is currently in. The trend states are Stopped, Forced Trigger, Running, and Tripped Trigger.
463, 473, 483, 493	Trend Output	The last 500 data values once the trigger condition is true and all post samples are gathered.

① The parameters for the four trend buffers behave in the same way. Therefore, the parameter names listed in this chapter are listed generically. For example, Tr1 Opnd Parm X is listed as Trend Operand Parameter X, or Operand X.

For more information about the trending parameters, refer to Chapter 6, *Parameters*.

Understanding How Trending Works

By using the trend parameters, you can monitor up to four parameters (trend 1 through trend 4). When trending is enabled or running, data points, or samples, are taken and stored in a circular buffer for the parameter linked to the Trend Input parameter. The PLC Communications Adapter Board continues to take data points until it either reaches a trigger point or a trigger is forced. A number of data points, called post samples, are then taken once the trend is triggered.

When complete, the data in the circular buffer is copied and ordered (from oldest to newest) in a secondary buffer. This buffer is then available for viewing as long as power is applied, until another trigger condition occurs (continuous mode), a BRAM recall/initialize is executed, or the system is reset.

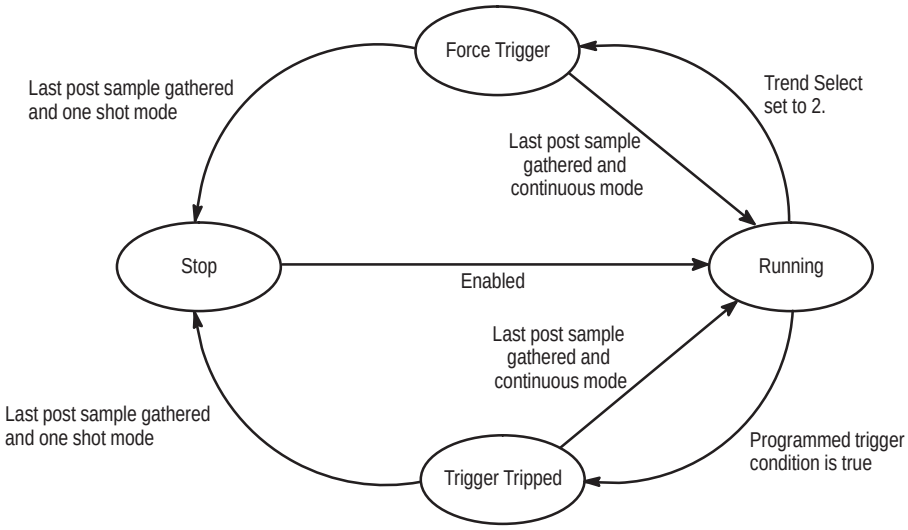
Within this process, you determine:

- the parameter(s) you want to monitor
- the rate at which you want the data sampled
- the trigger point
- the number of samples taken after the trigger point has been reached
- whether you want a single trend to be performed or continuous trending

The trending operation has four associated states:

When a trend is in this state:	Then:
Stopped	No data samples are being taken and Trend Output contains the data samples that have been taken for the previous trend.
Running	The trigger condition has not been reached and data samples are being taken at the specified rate. Trend Input contains the data samples from the current trend, and Trend Output contains the data samples from the previous trend.
Tripped Trigger	The trigger condition has become true and the post samples are being taken.
Forced Trigger	The trigger condition was forced to be true so that the post samples could be taken.

A trend may go through the following states:


Force Trigger
Last post sample gathered and one shot mode
Trend Select set to 2.
Last post sample gathered and continuous mode
Stop
Enabled
Running
Last post sample gathered and continuous mode
Last post sample gathered and one shot mode
Programmed trigger condition is true
Trigger Tripped

You can use the Trend Status parameter to determine the current state of the trend operation.

Note: If you are viewing a trend status parameter on a device such as the Bulletin 1201 Graphics Programming Terminal (GPT), it is possible to be in a constant triggered state and never see a running state. This condition could occur if you are using a continuous trend and the sample condition is always true.

Setting Up the Trigger Point

The trigger point specifies the condition to trap on and then gather the programmable post samples. The following statement determines the trigger point:

[Operand X] [Operator] [Operand Y]

The value of the parameter specified by Operand X is compared to the value specified by Operand Y. If the condition specified by Operator is true, then the trend is triggered and the PLC Communications Adapter Board begins to write data in the Trend Output parameter once all post samples have been gathered at the same rate as the data was sampled.

You should generally link Operand X to a parameter, while Operand Y can be either a constant or a link to another parameter.

Important: You should make sure that you are comparing either both signed parameters or both unsigned parameters. Trying to compare a signed parameter to an unsigned parameter could cause unexpected results.

The following operators are available:

This Operator:	Compares:
GT (Greater Than)	The data value for Operand X to the data value for Operand Y. If the comparison is true, the trend is triggered.
LT (Less Than)	The data value for Operand X to the data value for Operand Y. If the comparison is true, the trend is triggered.
EQ (Equal)	The data value for Operand X to the data value for Operand Y. If the comparison is equal, the trend is triggered.
NE (Not Equal)	The data value for Operand X to the data value for Operand Y. If the comparison is not equal, the trend is triggered.
AND	Operand X① to a 16–bit mask value in Operand Y②. If all the bit(s) in Operand X corresponding to the the bit(s) set in Operand Y are 1's, then the trigger condition is true.
NAND (Negated AND)	Operand X① to a 16–bit mask value in Operand Y②. If all the bit(s) in Operand X corresponding to the bit(s) set in Operand Y are 0's, then the trigger condition is true.
OR	Operand X① to a 16–bit mask value in Operand Y②. If any bit(s) in Operand X corresponding to the bit(s) set in Operand Y are 1's, then the trigger condition is true.
NOR (Negated OR)	Operand X① to a 16–bit mask value in Operand Y②. If any bit(s) in Operand X corresponding to the bit(s) set in Operand Y are 0's, then the trigger condition is true.

①Operand X is generally linked to a 16–bit parameter such as Logic Status.
②Operand Y specifies the bit(s) to check in Operand X.

To set the trigger condition:

1. Select the Operand X parameter for the appropriate trend (parameter number 455, 465, 475, or 485).
2. Enter a constant or a link to another parameter to set up the first part of the trigger point condition.
3. Select the Operator parameter for the appropriate trend (parameter number 457, 467, 477, or 487).
4. Select the appropriate operator.
5. Select the Operand Y parameter for the appropriate trend (parameter number 456, 466, 476, or 486).
6. Select the second parameter or enter the appropriate value.

You can change any of these parameters while the trend is active.

Note: For ease of programming, the value of Operand Y is displayed in the same units as Operand X. For example, if Operand X is linked to Velocity Feedback, then the value of Operand Y is displayed in rpms.

AND, NAND, OR, and NOR

The AND, NAND, OR, and NOR logic operators are special in that they are not defined as you might expect. In addition, if you are using these logic operators, you will generally set either Operand X or Operand Y to a constant value.

Important: If you set either Operand X or Operand Y to 0, the trigger condition will never be true because the PLC Communications Adapter Board will not know which bits you want to monitor.

The following examples are provided to help you better understand how the PLC Communications Adapter Board interprets these logic operators. The following examples use an x when the PLC Communications Adapter Board does not care whether that particular bit is set. The examples also assume that Operand X is linked to a 16–bit parameter.

If you use the AND operator and set Operand Y to a mask value of 0000 0100 0001 0011, the trigger condition is only true when Operand X has a value of xxxx x1xx xxx1 xx11.

If you use the NAND operator and set Operand Y to a mask value of 0000 0100 0001 0011, the trigger condition is only true when Operand X has a value of xxxx x0xx xxx0 xx00.

If you use the OR operator and set Operand Y to a mask value of 0000 0001 0100 0000, the trigger condition is only true when Operand X has a value of:

xxxx xxx1 x0xx xxxx
xxxx xxx1 x1xx xxxx
xxxx xxx0 x1xx xxxx.

If you use the NOR operator and set Operand Y to a mask value of 0000 0001 0100 0000, the trigger condition is only true when Operand X has a value of:

xxxx xxx1 x0xx xxxx
xxxx xxx0 x0xx xxxx
xxxx xxx0 x1xx xxxx.

Adjusting the Data Sample Rate

You can specify how often you want the PLC Communications Adapter Board to take data samples. Data samples may be taken in a range of 2 milliseconds to 30 seconds, in 2 millisecond increments. The rate at which the data is sampled and at which the trigger condition is evaluated is the same up to 20 milliseconds. This assures that possible trigger conditions are monitored whenever the sample rate exceeds 20 milliseconds.

To set the data sample rate:

1. Select the Sample Rate parameter for the appropriate trend (parameter number 458, 468, 478, or 488).
2. Enter the sample rate. The drive rounds this value to the nearest 2 millisecond interval.

You can change the sample rate while the trend is active.

Setting the Number of Post Samples

You also need to specify the number of data samples taken once a trigger condition occurs. You can specify that 0 through 499 post samples be taken, with one sample reserved for the instance when the trigger condition becomes true.

Typically, when a trend buffer is set to trigger on a fault, you would set the post sample parameter to a lower number, such as 20. This allows you to evaluate the trended parameters data from before the trigger.

When a trend buffer is set up as a level detector, the post sample parameter is generally set to a higher value. This allows you to evaluate what happened after the trigger occurred.

To set the number of post samples:

1. Select the Post Samples parameter for the appropriate trend (parameter number 459, 469, 479, or 489).
2. Enter the number of data points to be taken after the trigger condition becomes true.

You can change the number of post samples while the trend is active.

Note: If the trigger condition occurs before the pre–samples can be taken, the pre–samples may be unreliable. The pre–samples are valid if the trigger does not occur in less than the pre–sample time after the trend is enabled and in the continuous mode after a trigger. You can use the following formula to determine the pre–sample time:

pre–sample time = (500 – Post Samples – 1) * Sample Rate

Setting the Buffer Type

Each trend can also be set up as a one–shot or continuous trigger buffer. When you set up a trend as one–shot, the trend returns to the stopped state after all post samples have been taken. Even though the trend is stopped, the sampled data continues to be written to the Trend Output parameter.

When you set up a trend as continuous, the trend operation continues after the post samples have been taken. When a new trigger condition occurs, the previous data samples are overwritten.

To set the buffer type:

1. Select the Trend Continuous Trigger parameter for the appropriate trend (parameter number 460, 470, 480, or 490).
2. Select 0 if you want to perform a one–shot operation or 1 if you want the trending to be continuous.

You can change the buffer type while the trend is active.

For a continuous trend, when the trigger condition becomes true and after the post samples are gathered, there is a period of time when samples are not being taken. Trending uses this time period to do some internal housekeeping.

Forcing a Trigger Condition

At times, you may want to force a trigger condition. The trend operation will start taking post samples even though the programmed trigger condition has not been met.

To force a trigger condition:

1. Select the Trend Select parameter for the appropriate trend (parameter number 461, 471, 481, or 491).
2. Select a value of 2 to force the trigger.
3. When all post samples are gathered, the Trend Select parameter is changed to Disable (for one–shot) or Enable (for continuous).

Using Cascading Trends

By using cascading trends, you can collect more than 500 data points. A cascading trend refers to the method of having one trend set to trigger when another trend either triggers or is forced. The second trend then starts collecting data points as soon as the first trend finishes collecting its post samples.

To create a cascading trend:

1. Set up your first trend as normal.
2. Set up your second trend with the same information as the first trend with one exception: you need to set the second trend to trigger when either the Trend Select parameter for the first trend is equal to Disable or the Trend Status parameter for the first trend is equal to Triggered.

The order of the trends is important. If you set up Trend 3 as your first trend and Trend 2 as your second trend, there is a 10 millisecond delay before Trend 2 triggers and starts collecting data points. However, if you set up Trend 2 as your first trend and Trend 3 as your second trend, Trend 3 immediately triggers and starts collecting data points. This is a result of the way that the drive updates the parameters.

Looking at the Results of the Trend

When the trend output is linked to the analog output and a chart recorder is then connected to the analog output, you can view the trend output. To help you find the starting point of the trend, look for a negative spike followed by a positive spike. These spikes are added automatically to indicate the oldest piece of sampled data.

If you want to take a look at the current data, you can read the real time trend sample data. To do this, you should use the DriveTrending portion of the DriveTools software.

You can also use a GPT to view the output data of a trend.

Example Trends

In this first example, when the torque command is greater than 25%, the trend triggers and 50 post samples are taken at a rate of 4 milliseconds. To set up this trend, you would need to do the following:

1. Decide which trend you are setting up (trend 1, trend 2, trend 3, trend 4). For this example, trend 1 is used.
2. Link parameter 454 (Trend Input 1) to parameter 167 (Internal Torque Cmd).
3. Link parameter 455 (Tr1 Opnd Parm X) to parameter 167 (Internal Torque Cmd).
4. Select GT for parameter 457 (Tr1 Operator).
5. Enter 25 for parameter 456 (Tr1 Opnd Parm Y).
6. Enter 50 for parameter 459 (Tr1 Post Samples).
7. Enter 4 for parameter 458 (Tr1 Sample Rate).
8. Enter 1 for Trend Continuous Trigger to specify that a one–shot operation is to be performed.
9. Link the Trend Output parameter to the Analog Output parameter.

In the second example, the trend triggers and begins taking 100 post samples at a rate of 2 milliseconds when the velocity feedback parameter is greater than the velocity reference parameter.

1. Decide which trend you are setting up (trend 1, trend 2, trend 3, trend 4).
2. Link the Trend Input parameter to the velocity feedback parameter.
3. Link the Operand X parameter to the velocity feedback parameter.
4. Select GT for Operator.
5. Link the Operand Y parameter to the velocity reference parameter.
6. Enter 100 for Post Samples.
7. Enter 2 for Sampling Rate.
8. Enter 1 for Trend Continuous Trigger to specify that a one–shot operation is to be performed.
9. Link the Trend Output parameter to the Analog Output parameter.

Specifications and Supplementals Information

Chapter Objectives

Chapter 10 provides specifications and supplemental information including a parameter cross reference by number or name, parameter block diagrams, a hardware block diagram, and PLC Communications Adapter Board DIP switch settings.

Specifications

The following table shows the specifications for the PLC Communications Adapter Board:

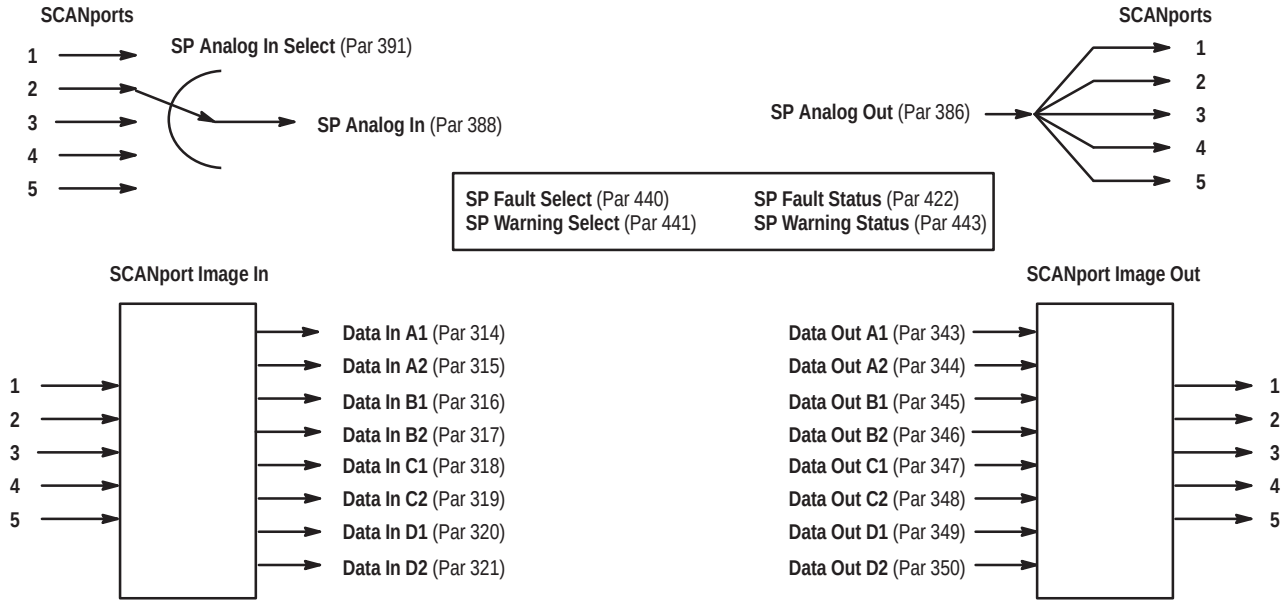
This category:	Has these specifications:
Environmental	Operating temperature: 0 to 40°C (32 to 104°F)
	Storage temperature: –40 to 70°C (–40 to 158°F)
	Relative humidity: 5 to 95% non–condensing
	Shock: 15G peak for 11 ms duration (±1.0 ms)
	Vibration: 0.15 mm (0.006 inches) displacement, 1G peak
Electrical	Input voltage: supplied by drive
	Input frequency: NA
	Input current: NA
	SCANport load: 60 mA
	Vibration: 0.15 mm (0.006 inches) displacement, 1G peak
Communications	Drive side: SCANport peripheral interface
	PLC side: Allen–Bradley RIO/DH+
	Baud rate: 57.6K, 115.2K, or 230.4K
	Rack size: 1/4, 1/2, 3/4, or full
Product Compatibility	The PLC Communications Adapter Board is designed to be used with the following terminal interface devices (TIDs): Drive Tools Allen–Bradley Programmable Controllers① • PLC–5/10, PLC–5/15, PLC–5/25 Family • PLC–5/40 and 5/60 as scanner and as adapter② • PLC –5/40L Family 1771–ASB② Flex I/O② ① These adapters were tested with the current revision level of the listed PLC processors. Earlier versions of these processors may not be compatible. ② RIO scanner has only been tested with these devices.

This category:	Has these specifications:
Analog I/O	Differential impedance for input: greater than 1 Ohm
	Single–ended impedance for input: 20K Ohm
	Maximum voltage for input: ±10V
	Output impedance: 100 Ohm
	Output voltage: ±10V
	Maximum current for output 1mA

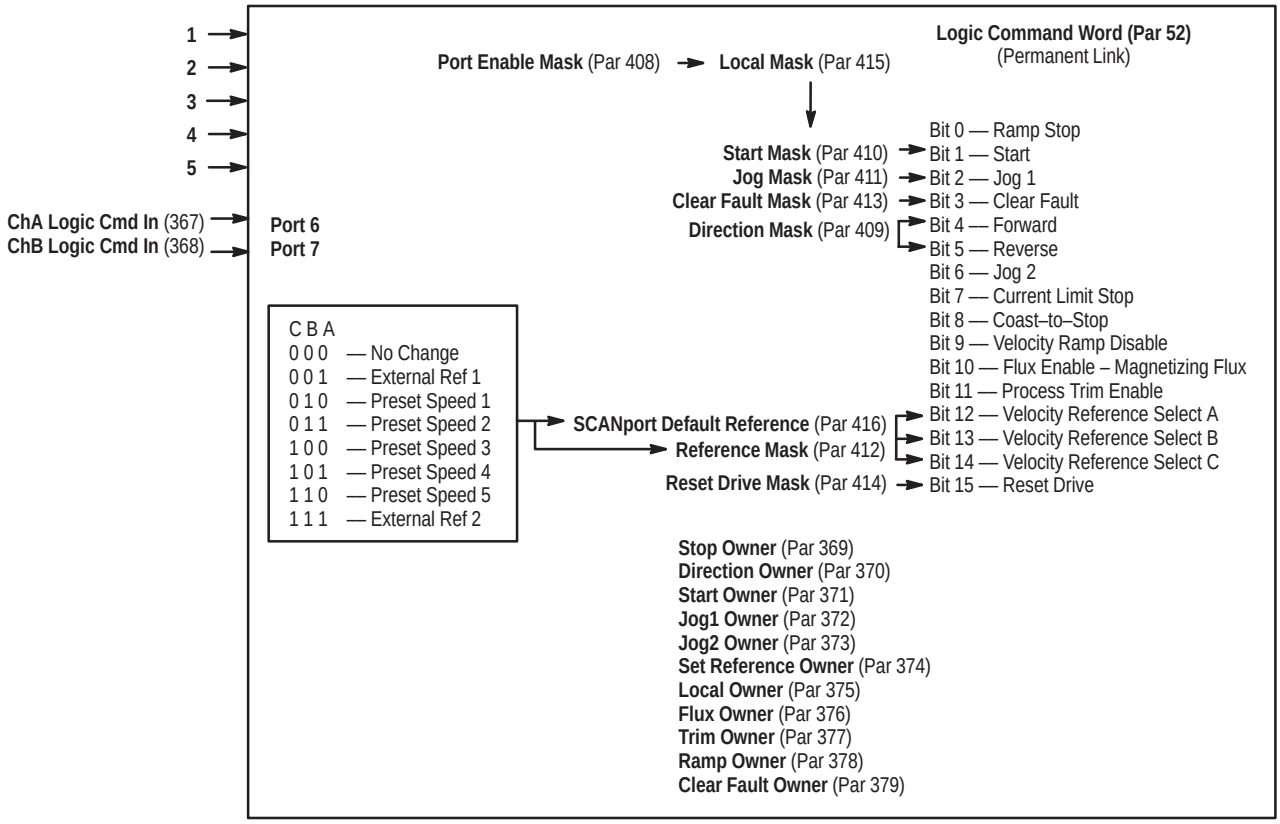
Software Block Diagram

The following figures show the parameter linking and interactions within the PLC Communications Adapter Board. For more information about parameter linking, refer to Chapter 5, *Understanding the Resources of Your Drive*.

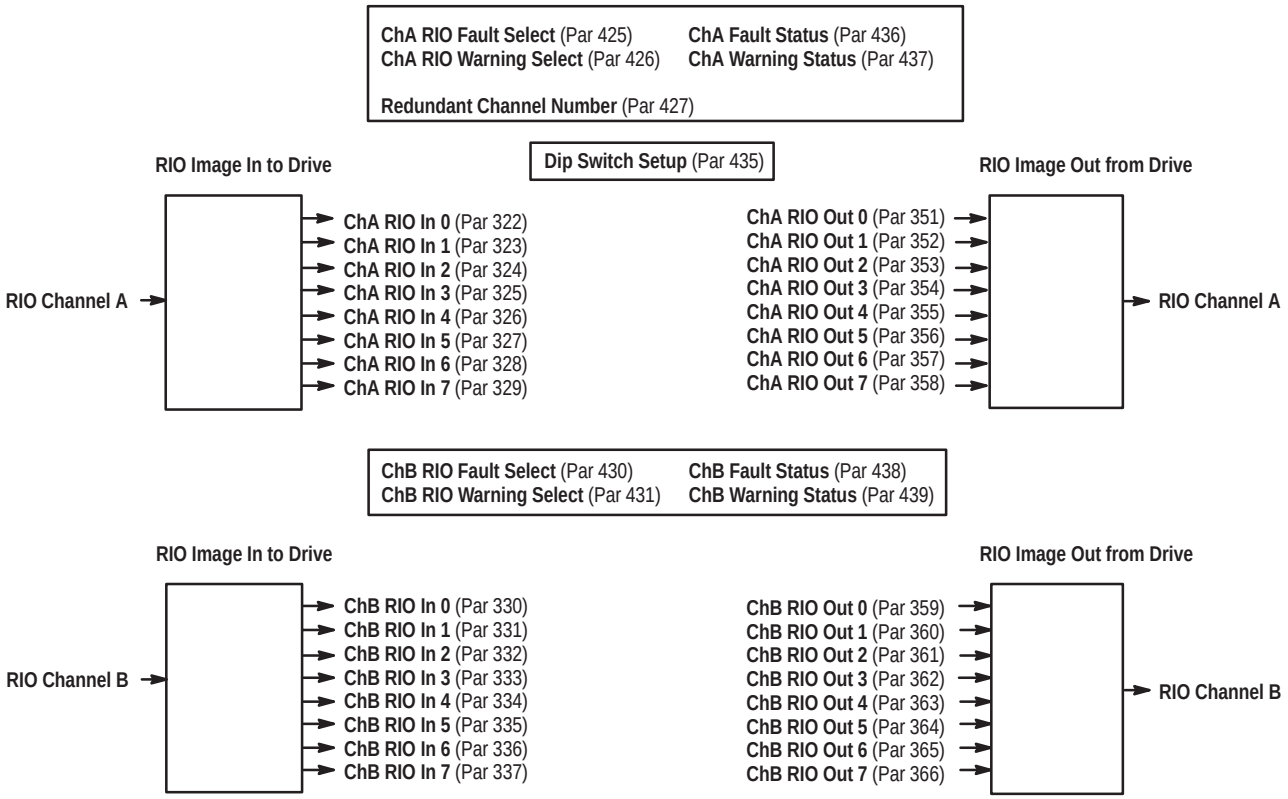
SCANport



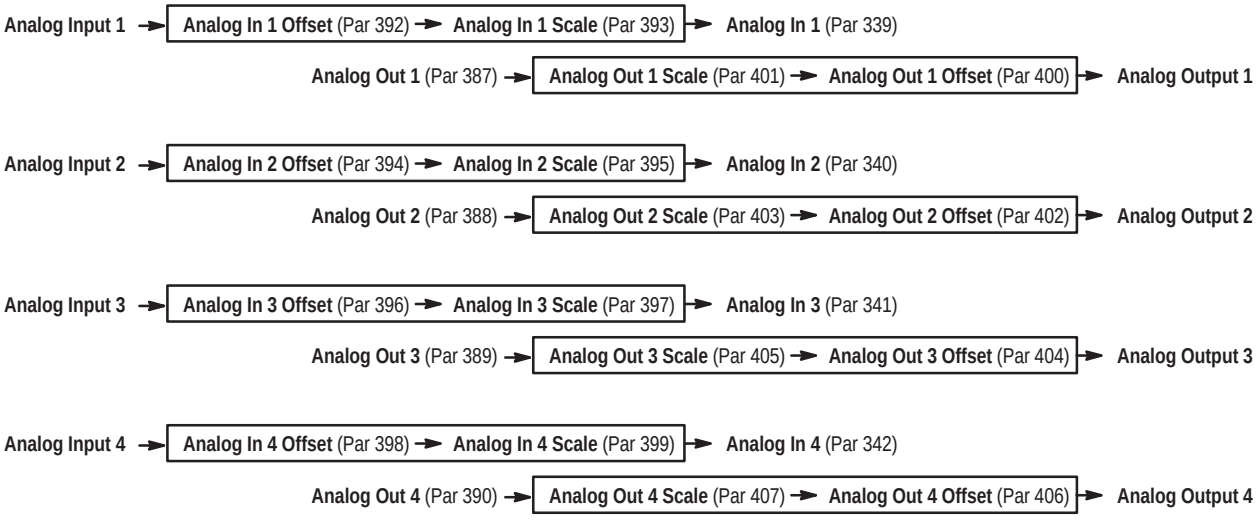
Logic Command


1
2
3
4
5
ChA Logic Cmd In (367)
ChB Logic Cmd In (368)
Port 6
Port 7
Port Enable Mask (Par 408)
Local Mask (Par 415)
Logic Command Word (Par 52)
(Permanent Link)
Start Mask (Par 410)
Jog Mask (Par 411)
Clear Fault Mask (Par 413)
Direction Mask (Par 409)
Bit 0 — Ramp Stop
Bit 1 — Start
Bit 2 — Jog 1
Bit 3 — Clear Fault
Bit 4 — Forward
Bit 5 — Reverse
Bit 6 — Jog 2
Bit 7 — Current Limit Stop
Bit 8 — Coast–to–Stop
Bit 9 — Velocity Ramp Disable
Bit 10 — Flux Enable – Magnetizing Flux
Bit 11 — Process Trim Enable
Bit 12 — Velocity Reference Select A
Bit 13 — Velocity Reference Select B
Bit 14 — Velocity Reference Select C
Bit 15 — Reset Drive
C B A
0 0 0 — No Change
0 0 1 — External Ref 1
0 1 0 — Preset Speed 1
0 1 1 — Preset Speed 2
1 0 0 — Preset Speed 3
1 0 1 — Preset Speed 4
1 1 0 — Preset Speed 5
1 1 1 — External Ref 2
SCANport Default Reference (Par 416)
Reference Mask (Par 412)
Reset Drive Mask (Par 414)
Stop Owner (Par 369)
Direction Owner (Par 370)
Start Owner (Par 371)
Jog1 Owner (Par 372)
Jog2 Owner (Par 373)
Set Reference Owner (Par 374)
Local Owner (Par 375)
Flux Owner (Par 376)
Trim Owner (Par 377)
Ramp Owner (Par 378)
Clear Fault Owner (Par 379)

RIO Parameters

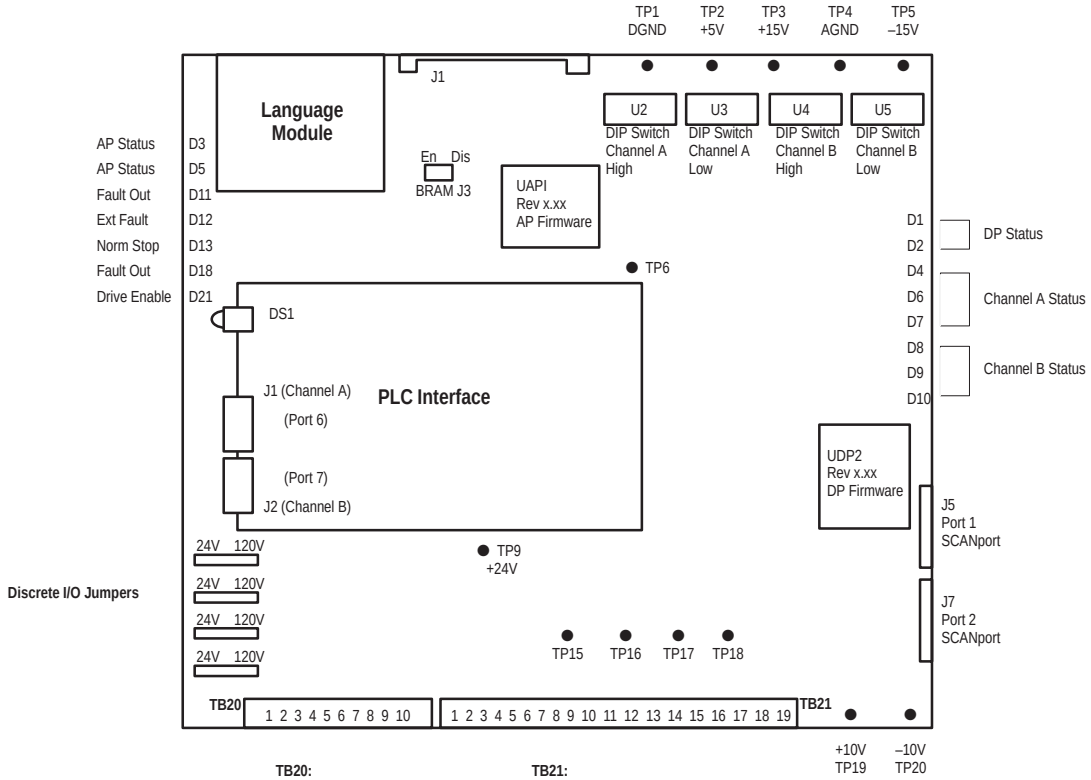

ChA RIO Fault Select (Par 425)
ChA Fault Status (Par 436)
ChA RIO Warning Select (Par 426)
ChA Warning Status (Par 437)
Redundant Channel Number (Par 427)
Dip Switch Setup (Par 435)
RIO Image In to Drive
RIO Image Out from Drive
RIO Channel A
ChA RIO In 0 (Par 322)
ChA RIO In 1 (Par 323)
ChA RIO In 2 (Par 324)
ChA RIO In 3 (Par 325)
ChA RIO In 4 (Par 326)
ChA RIO In 5 (Par 327)
ChA RIO In 6 (Par 328)
ChA RIO In 7 (Par 329)
ChA RIO Out 0 (Par 351)
ChA RIO Out 1 (Par 352)
ChA RIO Out 2 (Par 353)
ChA RIO Out 3 (Par 354)
ChA RIO Out 4 (Par 355)
ChA RIO Out 5 (Par 356)
ChA RIO Out 6 (Par 357)
ChA RIO Out 7 (Par 358)
RIO Channel A
ChB RIO Fault Select (Par 430)
ChB Fault Status (Par 438)
ChB RIO Warning Select (Par 431)
ChB Warning Status (Par 439)
RIO Image In to Drive
RIO Image Out from Drive
RIO Channel B
ChB RIO In 0 (Par 330)
ChB RIO In 1 (Par 331)
ChB RIO In 2 (Par 332)
ChB RIO In 3 (Par 333)
ChB RIO In 4 (Par 334)
ChB RIO In 5 (Par 335)
ChB RIO In 6 (Par 336)
ChB RIO In 7 (Par 337)
ChB RIO Out 0 (Par 359)
ChB RIO Out 1 (Par 360)
ChB RIO Out 2 (Par 361)
ChB RIO Out 3 (Par 362)
ChB RIO Out 4 (Par 363)
ChB RIO Out 5 (Par 364)
ChB RIO Out 6 (Par 365)
ChB RIO Out 7 (Par 366)
RIO Channel B

Analog I/O Parameters


Analog Input 1
Analog In 1 Offset (Par 392)
Analog In 1 Scale (Par 393)
Analog In 1 (Par 339)
Analog Out 1 (Par 387)
Analog Out 1 Scale (Par 401)
Analog Out 1 Offset (Par 400)
Analog Output 1
Analog Input 2
Analog In 2 Offset (Par 394)
Analog In 2 Scale (Par 395)
Analog In 2 (Par 340)
Analog Out 2 (Par 388)
Analog Out 2 Scale (Par 403)
Analog Out 2 Offset (Par 402)
Analog Output 2
Analog Input 3
Analog In 3 Offset (Par 396)
Analog In 3 Scale (Par 397)
Analog In 3 (Par 341)
Analog Out 3 (Par 389)
Analog Out 3 Scale (Par 405)
Analog Out 3 Offset (Par 404)
Analog Output 3
Analog Input 4
Analog In 4 Offset (Par 398)
Analog In 4 Scale (Par 399)
Analog In 4 (Par 342)
Analog Out 4 (Par 390)
Analog Out 4 Scale (Par 407)
Analog Out 4 Offset (Par 406)
Analog Output 4

Hardware Block Diagram

The following is the hardware block diagram for the PLC Communications Adapter Board.



TB20:

1	Drive Enable
2	Motor Thermo
3	Norm Stop
4	Ext Fault
6	Input Com
8	Fault NC
9	Fault COM
10	Fault NO

TB21:

1	Out1
2	Com1
3	Out2
4	Com2
5	Out3
6	Com3
7	Out4
8	Com4
9	In1+
10	In1–
11	In2+
12	In2–
13	In3+
14	In3–
15	In4+
16	In4–
17	+10V
18	Com
19	–10V

Parameter Cross Reference––By Number

The following table lists the parameters in numerical order.

No.	Name	Group①	Page		No.	Name	Group①	Page
300	Adapter ID	1 — Adapter Info	6–12		344	Data Out A2	3 — SCANport I/O	6–21
301	Adapter Version	1 — Adapter Info	6–12		345	Data Out B1	3 — SCANport I/O	6–21
302	SP Comm Retries	1 — Adapter Info	6–12		346	Data Out B2	3 — SCANport I/O	6–21
303	ChA DIP Switch	7 — Channel A	6–12		347	Data Out C1	3 — SCANport I/O	6–21
304	ChB DIP Switch	8 — Channel B	6–12		348	Data Out C2	3 — SCANport I/O	6–22
305	ChA LED State	7 — Channel A	6–12		349	Data Out D1	3 — SCANport I/O	6–22
306	ChB LED State	8 — Channel B	6–13		350	Data Out D2	3 — SCANport I/O	6–22
307	PLC Comm Status	1 — Adapter Info	6–13		351	ChA RIO Out 0	7 — Channel A	6–22
309	Language Sel	1 — Adapter Info	6–13		352	ChA RIO Out 1	7 — Channel A	6–22
314	Data In A1	3 — SCANport I/O	6–13		353	ChA RIO Out 2	7 — Channel A	6–23
315	Data In A2	3 — SCANport I/O	6–13		354	ChA RIO Out 3	7 — Channel A	6–23
316	Data In B1	3 — SCANport I/O	6–13		355	ChA RIO Out 4	7 — Channel A	6–23
317	Data In B2	3 — SCANport I/O	6–14		356	ChA RIO Out 5	7 — Channel A	6–24
318	Data In C1	3 — SCANport I/O	6–14		357	ChA RIO Out 6	7 — Channel A	6–24
319	Data In C2	3 — SCANport I/O	6–14		358	ChA RIO Out 7	7 — Channel A	6–24
320	Data In D1	3 — SCANport I/O	6–14		359	ChB RIO Out 0	8 — Channel B	6–25
321	Data In D2	3 — SCANport I/O	6–14		360	ChB RIO Out 1	8 — Channel B	6–25
322	ChA RIO In 0	7 — Channel A	6–15		361	ChB RIO Out 2	8 — Channel B	6–25
323	ChA RIO In 1	7 — Channel A	6–15		362	ChB RIO Out 3	8 — Channel B	6–25
324	ChA RIO In 2	7 — Channel A	6–15		363	ChB RIO Out 4	8 — Channel B	6–26
325	ChA RIO In 3	7 — Channel A	6–16		364	ChB RIO Out 5	8 — Channel B	6–26
326	ChA RIO In 4	7 — Channel A	6–16		365	ChB RIO Out 6	8 — Channel B	6–26
327	ChA RIO In 5	7 — Channel A	6–16		366	ChB RIO Out 7	8 — Channel B	6–26
328	ChA RIO In 6	7 — Channel A	6–17		367	ChA Logic Cmd In	3 — SCANport I/O	6–27
329	ChA RIO In 7	7 — Channel A	6–17		368	ChB Logic Cmd In	3 — SCANport I/O	6–27
330	ChB RIO In 0	8 — Channel B	6–17		369	Stop Owner	5 — Owners	6–27
331	ChB RIO In 1	8 — Channel B	6–18		370	Dir Owner	5 — Owners	6–28
332	ChB RIO In 2	8 — Channel B	6–18		371	Start Owner	5 — Owners	6–28
333	ChB RIO In 3	8 — Channel B	6–18		372	Jog 1 Owner	5 — Owners	6–28
334	ChB RIO In 4	8 — Channel B	6–19		373	Jog 2 Owner	5 — Owners	6–28
335	ChB RIO In 5	8 — Channel B	6–19		374	Set Ref Owner	5 — Owners	6–28
336	ChB RIO In 6	8 — Channel B	6–19		375	Local Owner	5 — Owners	6–29
337	ChB RIO In 7	8 — Channel B	6–20		376	Flux Owner	5 — Owners	6–29
338	SP Analog In	3 — SCANport I/O	6–20		377	Trim Owner	5 — Owners	6–29
339	Analog In 1	6 — Analog I/O	6–20		378	Ramp Owner	5 — Owners	6–29
340	Analog In 2	6 — Analog I/O	6–20		379	Clr Fault Owner	5 — Owners	6–29
341	Analog In 3	6 — Analog I/O	6–20		386	SP Analog Out	3 — SCANport I/O	6–30
342	Analog In 4	6 — Analog I/O	6–21		387	Analog Out 1	6 — Analog I/O	6–30
343	Data Out A1	3 — SCANport I/O	6–21		388	Analog Out 2	6 — Analog I/O	6–30

① Parameters included in Groups 7 and 8 depend on the selected communications.

▶ Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

No.	Name	Group①	Page		No.	Name	Group①	Page
389	Analog Out 3	6 — Analog I/O	6–30		443	SP Warn Sts	2 — Adapter Diagnostics	6–46
390	Analog Out 4	6 — Analog I/O	6–30		454	Trend In 1	9 — Trend I/O	6–46
391	SP Analog Sel	3 — SCANport I/O	6–31		455	Tr1 Opnd Parm X	9 — Trend Setup	6–46
392	An In 1 Offset	6 — Analog I/O	6–31		456	Tr1 Opnd Parm Y	9 — Trend Setup	6–47
393	An In 1 Scale	6 — Analog I/O	6–31		457	Tr1 Operator	9 — Trend Setup	6–47
394	An In 2 Offset	6 — Analog I/O	6–31		458	Tr1 Sample Rate	9 — Trend Setup	6–47
395	An In 2 Scale	6 — Analog I/O	6–32		459	Tr1 Post Samples	9 — Trend Setup	6–47
396	An In 3 Offset	6 — Analog I/O	6–32		460	Tr1 Cont Trigger	9 — Trend Setup	6–48
397	An In 3 Scale	6 — Analog I/O	6–32		461	Tr1 Select	9 — Trend Setup	6–48
398	An In 4 Offset	6 — Analog I/O	6–32		462	Tr1 Status	9 — Trend I/O	6–48
399	An In 4 Scale	6 — Analog I/O	6–33		463	Trend Out 1	9 — Trend I/O	6–48
400	An Out 1 Offset	6 — Analog I/O	6–33		464	Trend In 2	9 — Trend I/O	6–49
401	An Out 1 Scale	6 — Analog I/O	6–33		465	Tr2 Opnd Parm X	9 — Trend Setup	6–49
402	An Out 2 Offset	6 — Analog I/O	6–33		466	Tr2 Opnd Parm Y	9 — Trend Setup	6–49
403	An Out 2 Scale	6 — Analog I/O	6–34		467	Tr2 Operator	9 — Trend Setup	6–49
404	An Out 3 Offset	6 — Analog I/O	6–34		468	Tr2 Sample Rate	9 — Trend Setup	6–50
405	An Out 3 Scale	6 — Analog I/O	6–34		469	Tr2 Post Samples	9 — Trend Setup	6–50
406	An Out 4 Offset	6 — Analog I/O	6–34		470	Tr2 Cont Trigger	9 — Trend Setup	6–50
407	An Out 4 Scale	6 — Analog I/O	6–35		471	Tr2 Select	9 — Trend Setup	6–50
408	Port Enable	4 — Masks	6–35		472	Tr2 Status	9 — Trend I/O	6–50
409	Dir Mask	4 — Masks	6–35		473	Trend Out 2	9 — Trend I/O	6–51
410	Start Mask	4 — Masks	6–35		474	Trend In 3	9 — Trend I/O	6–51
411	Jog Mask	4 — Masks	6–36		475	Tr3 Opnd Parm X	9 — Trend Setup	6–51
412	Ref Mask	4 — Masks	6–36		476	Tr3 Opnd Parm Y	9 — Trend Setup	6–51
413	Clr Fault Mask	4 — Masks	6–36		477	Tr3 Operator	9 — Trend Setup	6–52
414	Reset Drive Mask	4 — Masks	6–36		478	Tr3 Sample Rate	9 — Trend Setup	6–52
415	Local Mask	4 — Masks	6–36		479	Tr3 Post Samples	9 — Trend Setup	6–52
416	SP Default Ref	3 — Velocity Ref	6–37		480	Tr3 Cont Trigger	9 — Trend Setup	6–52
425	ChA RIO Flt Sel	2 — Adapter Diagnostics	6–38		481	Tr3 Select	9 — Trend Setup	6–53
426	ChA RIO Warn Sel	2 — Adapter Diagnostics	6–39		482	Tr3 Status	9 — Trend I/O	6–53
427	Redund Chan No	7 — Channel A	6–40		483	Trend Out 3	9 — Trend I/O	6–53
430	ChB RIO Flt Sel	2 — Adapter Diagnostics	6–41		484	Trend In 4	9 — Trend I/O	6–53
431	ChB RIO Warn Sel	2 — Adapter Diagnostics	6–42		485	Tr4 Opnd Parm X	9 — Trend Setup	6–54
432	ChB RIOS Retries	8 — Channel B	6–43		486	Tr4 Opnd Parm Y	9 — Trend Setup	6–54
435	DIP Fault Setup	2 — Adapter Diagnostics	6–43		487	Tr4 Operator	9 — Trend Setup	6–54
436	ChA Fault Sts	2 — Adapter Diagnostics	6–43		488	Tr4 Sample Rate	9 — Trend Setup	6–54
437	ChA Warn Sts	2 — Adapter Diagnostics	6–44		489	Tr4 Post Samples	9 — Trend Setup	6–55
438	ChB Fault Sts	2 — Adapter Diagnostics	6–44		490	Tr4 Cont Trigger	9 — Trend Setup	6–55
439	ChB Warn Sts	2 — Adapter Diagnostics	6–45		491	Tr4 Select	9 — Trend Setup	6–55
440	SP Fault Sel	2 — Adapter Diagnostics	6–45		492	Tr4 Status	9 — Trend I/O	6–55
441	SP Warn Sel	2 — Adapter Diagnostics	6–45		493	Trend Out 4	9 — Trend I/O	6–56
442	SP Fault Sts	2 — Adapter Diagnostics	6–46					

① Parameters included in Groups 7 and 8 depend on the selected communications.

▶ Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

Parameter Cross Reference––By Name

The following table lists the parameters alphabetically.

Name	No.	Group①	Page	Name	No.	Group①	Page
Adapter ID	300	1 — Adapter Info	6–12	ChA RIO Out 0	351	7 — Channel A	6–22
Adapter Version	301	1 — Adapter Info	6–12	ChA RIO Out 1	352	7 — Channel A	6–22
An In 1 Offset	392	6 — Analog I/O	6–31	ChA RIO Out 2	353	7 — Channel A	6–23
An In 1 Scale	393	6 — Analog I/O	6–31	ChA RIO Out 3	354	7 — Channel A	6–23
An In 2 Offset	394	6 — Analog I/O	6–31	ChA RIO Out 4	355	7 — Channel A	6–23
An In 2 Scale	395	6 — Analog I/O	6–32	ChA RIO Out 5	356	7 — Channel A	6–24
An In 3 Offset	396	6 — Analog I/O	6–32	ChA RIO Out 6	357	7 — Channel A	6–24
An In 3 Scale	397	6 — Analog I/O	6–32	ChA RIO Out 7	358	7 — Channel A	6–24
An In 4 Offset	398	6 — Analog I/O	6–32	ChA RIO Warn Sel	426	2 — Adapter Diagnostics	6–32
An In 4 Scale	399	6 — Analog I/O	6–33	ChA Warn Sts	437	2 — Adapter Diagnostics	6–44
An Out 1 Offset	400	6 — Analog I/O	6–33	ChB DIP Switch	304	8 — Channel B	6–12
An Out 1 Scale	401	6 — Analog I/O	6–33	ChB Fault Sts	438	2 — Adapter Diagnostics	6–44
An Out 2 Offset	402	6 — Analog I/O	6–33	ChB LED State	306	8 — Channel B	6–13
An Out 2 Scale	403	6 — Analog I/O	6–34	ChB Logic Cmd In	368	3 — SCANport I/O	6–27
An Out 3 Offset	404	6 — Analog I/O	6–34	ChB RIO Flt Sel	430	2 — Adapter Diagnostics	6–41
An Out 3 Scale	405	6 — Analog I/O	6–34	ChB RIO In 0	330	8 — Channel B	6–17
An Out 4 Offset	406	6 — Analog I/O	6–34	ChB RIO In 1	331	8 — Channel B	6–18
An Out 4 Scale	407	6 — Analog I/O	6–35	ChB RIO In 2	332	8 — Channel B	6–18
Analog In 1	339	6 — Analog I/O	6–20	ChB RIO In 3	333	8 — Channel B	6–18
Analog In 2	340	6 — Analog I/O	6–20	ChB RIO In 4	334	8 — Channel B	6–19
Analog In 3	341	6 — Analog I/O	6–20	ChB RIO In 5	335	8 — Channel B	6–19
Analog In 4	342	6 — Analog I/O	6–21	ChB RIO In 6	336	8 — Channel B	6–19
Analog Out 1	387	6 — Analog I/O	6–30	ChB RIO In 7	337	8 — Channel B	6–20
Analog Out 2	388	6 — Analog I/O	6–30	ChB RIO Out 0	359	8 — Channel B	6–25
Analog Out 3	389	6 — Analog I/O	6–30	ChB RIO Out 1	360	8 — Channel B	6–25
Analog Out 4	390	6 — Analog I/O	6–30	ChB RIO Out 2	361	8 — Channel B	6–25
ChA DIP Switch	303	7 — Channel A	6–12	ChB RIO Out 3	362	8 — Channel B	6–25
ChA Fault Sts	436	2 — Adapter Diagnostics	6–43	ChB RIO Out 4	363	8 — Channel B	6–26
ChA LED State	305	7 — Channel A	6–12	ChB RIO Out 5	364	8 — Channel B	6–26
ChA Logic Cmd In	367	3 — SCANport I/O	6–27	ChB RIO Out 6	365	8 — Channel B	6–26
ChA RIO Flt Sel	425	2 — Adapter Diagnostics	6–38	ChB RIO Out 7	366	8 — Channel B	6–26
ChA RIO In 0	322	7 — Channel A	6–15	ChB RIO Warn Sel	431	2 — Adapter Diagnostics	6–42
ChA RIO In 1	323	7 — Channel A	6–15	ChB RIOS Retries	432	8 — Channel B	6–43
ChA RIO In 2	324	7 — Channel A	6–15	ChB Warn Sts	439	2 — Adapter Diagnostics	6–45
ChA RIO In 3	325	7 — Channel A	6–16	Clr Fault Mask	413	4 — Masks	6–36
ChA RIO In 4	326	7 — Channel A	6–16	Clr Flt Owner	379	5 — Owners	6–29
ChA RIO In 5	327	7 — Channel A	6–16	Data In A1	314	3 — SCANport I/O	6–13
ChA RIO In 6	328	7 — Channel A	6–17	Data In A2	315	3 — SCANport I/O	6–13
ChA RIO In 7	329	7 — Channel A	6–17	Data In B1	316	3 — SCANport I/O	6–13

① Parameters included in Groups 7 and 8 depend on the selected communications.

② Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

Name	No.	Group①	No.		Name	No.	Group①	No.
Data In B2	317	3 — SCANport I/O	6–14		Tr1 Cont Trigger	460	9 — Trends	6–48
Data In C1	318	3 — SCANport I/O	6–14		Tr1 Operator	457	9 — Trends	6–47
Data In C2	319	3 — SCANport I/O	6–14		Tr1 Opnd Parm X	455	9 — Trends	6–46
Data In D1	320	3 — SCANport I/O	6–14		Tr1 Opnd Parm Y	456	9 — Trends	6–47
Data In D2	321	3 — SCANport I/O	6–14		Tr1 Post Samples	459	9 — Trends	6–47
Data Out A1	343	3 — SCANport I/O	6–21		Tr1 Sample Rate	458	9 — Trends	6–47
Data Out A2	344	3 — SCANport I/O	6–21		Tr1 Select	461	9 — Trends	6–48
Data Out B1	345	3 — SCANport I/O	6–21		Tr1 Status	462	9 — Trends	6–48
Data Out B2	346	3 — SCANport I/O	6–21		Tr2 Cont Trigger	470	9 — Trends	6–50
Data Out C1	347	3 — SCANport I/O	6–21		Tr2 Operator	467	9 — Trends	6–49
Data Out C2	348	3 — SCANport I/O	6–22		Tr2 Opnd Parm X	465	9 — Trends	6–49
Data Out D1	349	3 — SCANport I/O	6–22		Tr2 Opnd Parm Y	466	9 — Trends	6–49
Data Out D2	350	3 — SCANport I/O	6–22		Tr2 Post Samples	469	9 — Trends	6–50
DIP Fault Setup	435	2 — Adapter Diagnostics	6–43		Tr2 Sample Rate	468	9 — Trends	6–50
Dir Mask	409	4 — Masks	6–35		Tr2 Select	471	9 — Trends	6–50
Dir Owner	370	5 — Owners	6–28		Tr2 Status	472	9 — Trends	6–50
Flux Owner	376	5 — Owners	6–29		Tr3 Cont Trigger	480	9 — Trends	6–52
Jog 1 Owner	372	5 — Owners	6–28		Tr3 Operator	477	9 — Trends	6–52
Jog 2 Owner	373	5 — Owners	6–28		Tr3 Opnd Parm X	475	9 — Trends	6–51
Jog Mask	411	4 — Masks	6–36		Tr3 Opnd Parm Y	476	9 — Trends	6–51
Language Sel	309	1 — Adapter Info	6–13		Tr3 Post Samples	479	9 — Trends	6–52
Local Mask	415	4 — Masks	6–36		Tr3 Sample Rate	478	9 — Trends	6–52
Local Owner	375	5 — Owners	6–29		Tr3 Select	481	9 — Trends	6–53
PLC Comm Status	307	1 — Adapter Info	6–13		Tr3 Status	484	9 — Trends	6–53
Port Enable	408	4 — Masks	6–35		Tr4 Cont Trigger	490	9 — Trends	6–55
Ramp Owner	378	5 — Owners	6–29		Tr4 Operator	487	9 — Trends	6–54
Redund Chan No	427	7 — Channel A	6–40		Tr4 Opnd Parm X	485	9 — Trends	6–54
Ref Mask	412	4 — Masks	6–36		Tr4 Opnd Parm Y	486	9 — Trends	6–54
Reset Drive mask	414	4 — Masks	6–36		Tr4 Post Samples	489	9 — Trends	6–55
Set Ref Owner	374	5 — Owners	6–28		Tr4 Sample Rate	488	9 — Trends	6–54
SP Analog In	338	3 — SCANport I/O	6–20		Tr4 Select	491	9 — Trends	6–55
SP Analog Out	386	3 — SCANport I/O	6–30		Tr4 Status	494	9 — Trends	6–55
SP Analog Sel	391	3 — SCANport I/O	6–31		Trend In 1	454	9 — Trends	6–46
SP Comm Retries	302	1 — Adapter Info	6–12		Trend In 2	464	9 — Trends	6–49
SP Default Ref	416	3 — Velocity Ref	6–37		Trend In 3	474	9 — Trends	6–51
SP Fault Sel	440	2 — Adapter Diagnostics	6–45		Trend In 4	484	9 — Trends	6–53
SP Fault Sts	442	2 — Adapter Diagnostics	6–46		Trend Out 1	463	9 — Trends	6–48
SP Warn Sel	441	2 — Adapter Diagnostics	6–45		Trend Out 2	473	9 — Trends	6–51
SP Warn Sts	443	2 — Adapter Diagnostics	6–46		Trend Out 3	483	9 — Trends	6–53
Start Mask	410	4 — Masks	6–35		Trend Out 4	493	9 — Trends	6–56
Start Owner	371	5 — Owners	6–28		Trim Owner	377	4 — Owners	6–29
Stop Owner	369	5 — Owners	6–27					

① Parameters included in Groups 7 and 8 depend on the selected communications.

② Shaded parameters do not exist when DH+ is selected. Inputs are variable and depend on rack size and whether block transfer is enabled.

PLC Communications Adapter Board DIP Switch Settings

The following charts are designed to be used as reference for setting and checking your DIP switches. Refer to the appropriate chart for the protocol you are using.

RIO Adapter With or Without Block Transfer

	DIP Switches U2 (Channel A) or U4 (Channel B)								DIP Switches U3 (Channel A) or U5 (Channel B)							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Protocol																
RIO w/oBlock Transfer	Off	Off														
RIO w/Block Transfer	Off	On														
Baud Rate																
57.6K			Off	Off												
115.2K			Off	On												
230.4K			On	either												
RIO Rack Size																
1/4					Off	Off										
1/2					Off	On										
3/4					On	Off										
Full					On	On										
Not Last/Last																
Last							On									
Not Last							Off									
Redundant																
Yes								On								
No								Off								
RIO Starting Group																
0									Off	Off						
2									Off	On						
4									On	Off						
6									On	On						
RIO Rack Address																
01											Off	Off	Off	Off	Off	On
02											Off	Off	Off	Off	On	Off
03											Off	Off	Off	Off	On	On
04											Off	Off	Off	On	Off	Off
05											Off	Off	Off	On	Off	On
06											Off	Off	Off	On	On	Off
07											Off	Off	Off	On	On	On
10											Off	Off	On	Off	Off	Off
11											Off	Off	On	Off	Off	On
12											Off	Off	On	Off	On	Off
13											Off	Off	On	Off	On	On
14											Off	Off	On	On	Off	Off
15											Off	Off	On	On	Off	On
16											Off	Off	On	On	On	Off
17											Off	Off	On	On	On	On
RIO Rack Address																

	DIP Switches U2 (Channel A) or U4 (Channel B)								DIP Switches U3 (Channel A) or U5 (Channel B)							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
20											Off	On	Off	Off	Off	Off
21											Off	On	Off	Off	Off	On
22											Off	On	Off	Off	On	Off
23											Off	On	Off	Off	On	On
24											Off	On	Off	On	Off	Off
25											Off	On	Off	On	Off	On
26											Off	On	Off	On	On	Off
27											Off	On	Off	On	On	On
30											Off	On	On	Off	Off	Off
31											Off	On	On	Off	Off	On
32											Off	On	On	Off	On	Off
33											Off	On	On	Off	On	On
34											Off	On	On	On	Off	Off
35											Off	On	On	On	Off	On
36											Off	On	On	On	On	Off
37											Off	On	On	On	On	On
40											On	Off	Off	Off	Off	Off
41											On	Off	Off	Off	Off	On
42											On	Off	Off	Off	On	Off
43											On	Off	Off	Off	On	On
44											On	Off	Off	On	Off	Off
45											On	Off	Off	On	Off	On
46											On	Off	Off	On	On	Off
47											On	Off	Off	On	On	On
50											On	Off	On	Off	Off	Off
51											On	Off	On	Off	Off	On
52											On	Off	On	Off	On	Off
53											On	Off	On	Off	On	On
54											On	Off	On	On	Off	Off
55											On	Off	On	On	Off	On
56											On	Off	On	On	On	Off
57											On	Off	On	On	On	On
60											On	On	Off	Off	Off	Off
61											On	On	Off	Off	Off	On
62											On	On	Off	Off	On	Off
63											On	On	Off	Off	On	On
64											On	On	Off	On	Off	Off
65											On	On	Off	On	Off	On
66											On	On	Off	On	On	Off
67											On	On	Off	On	On	On

	DIP Switches U2 (Channel A) or U4 (Channel B)								DIP Switches U3 (Channel A) or U5 (Channel B)							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
RIO Rack Address																
70											On	On	On	Off	Off	Off
71											On	On	On	Off	Off	On
72											On	On	On	Off	On	Off
73											On	On	On	Off	On	On
74											On	On	On	On	Off	Off
75											On	On	On	On	Off	On
76											On	On	On	On	On	Off
77											On	On	On	On	On	On

DH+

	DIP Switches U2 (Channel A) or U4 (Channel B)								DIP Switches U3 (Channel A) or U5 (Channel B)							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Protocol																
DH+	On	Off														
Baud Rate																
57.6K			Off	Off												
115.2K			Off	On												
230.4K			On	Either												
Not Applicable					na	na	na	na	na	na						
DH+ Station Address																
00											Off	Off	Off	Off	Off	Off
01											Off	Off	Off	Off	Off	On
02											Off	Off	Off	Off	On	Off
03											Off	Off	Off	Off	On	On
04											Off	Off	Off	On	Off	Off
05											Off	Off	Off	On	Off	On
06											Off	Off	Off	On	On	Off
07											Off	Off	Off	On	On	On
10											Off	Off	On	Off	Off	Off
11											Off	Off	On	Off	Off	On
12											Off	Off	On	Off	On	Off
13											Off	Off	On	Off	On	On
14											Off	Off	On	On	Off	Off
15											Off	Off	On	On	Off	On
16											Off	Off	On	On	On	Off
17											Off	Off	On	On	On	On
20											Off	On	Off	Off	Off	Off
21											Off	On	Off	Off	Off	On
22											Off	On	Off	Off	On	Off
23											Off	On	Off	Off	On	On
24											Off	On	Off	On	Off	Off
25											Off	On	Off	On	Off	On
26											Off	On	Off	On	On	Off
27											Off	On	Off	On	On	On

RIO Rack Address	DIP Switches U2 (Channel A) or U4 (Channel B)	DIP Switches U3 (Channel A) or U5 (Channel B)					
30		Off	On	On	Off	Off	Off
31		Off	On	On	Off	Off	On
32		Off	On	On	Off	On	Off
33		Off	On	On	Off	On	On
34		Off	On	On	On	Off	Off
35		Off	On	On	On	Off	On
36		Off	On	On	On	On	Off
37		Off	On	On	On	On	On
40		On	Off	Off	Off	Off	Off
41		On	Off	Off	Off	Off	On
42		On	Off	Off	Off	On	Off
43		On	Off	Off	Off	On	On
44		On	Off	Off	On	Off	Off
45		On	Off	Off	On	Off	On
46		On	Off	Off	On	On	Off
47		On	Off	Off	On	On	On
50		On	Off	On	Off	Off	Off
51		On	Off	On	Off	Off	On
52		On	Off	On	Off	On	Off
53		On	Off	On	Off	On	On
54		On	Off	On	On	Off	Off
55		On	Off	On	On	Off	On
56		On	Off	On	On	On	Off
57		On	Off	On	On	On	On
60		On	On	Off	Off	Off	Off
61		On	On	Off	Off	Off	On
62		On	On	Off	Off	On	Off
63		On	On	Off	Off	On	On
64		On	On	Off	On	Off	Off
65		On	On	Off	On	Off	On
66		On	On	Off	On	On	Off
67		On	On	Off	On	On	On
70		On	On	On	Off	Off	Off
71		On	On	On	Off	Off	On
72		On	On	On	Off	On	Off
73		On	On	On	Off	On	On
74		On	On	On	On	Off	Off
75		On	On	On	On	Off	On
76		On	On	On	On	On	Off
77		On	On	On	On	On	On

RIO Scanner

	DIP Switches U2 (Channel A) or U4 (Channel B)								DIP Switches U3 (Channel A) or U5 (Channel B)①							
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
Protocol																
RIO Scanner	On	On														
Baud Rate																
57.6K			Off	Off												
115.2K			Off	On												
230.4K			On	Either												
Not Used			On	On												
Not Applicable					na	na	na									
Scanner																
Yes								On								
No								Off								
RIO Rack Allocation																

Quarter 4	Quarter 3	Quarter 2	Quarter 1								
			1/4	Off	Off	Off	Off	Off	Off	Off	On
		1/4		Off	Off	Off	Off	Off	On	Off	Off
	1/4			Off	Off	Off	On	Off	Off	Off	Off
1/4				Off	On	Off	Off	Off	Off	Off	Off
		1/4	1/4	Off	Off	Off	Off	Off	On	Off	On
	1/4		1/4	Off	Off	Off	On	Off	Off	Off	On
1/4			1/4	Off	On	Off	Off	Off	Off	Off	On
	1/4	1/4		Off	Off	Off	On	Off	On	Off	Off
1/4		1/4		Off	On	Off	Off	Off	On	Off	Off
1/4	1/4			Off	On	Off	On	Off	Off	Off	Off
	1/4	1/4	1/4	Off	Off	Off	On	Off	On	Off	On
1/4		1/4	1/4	Off	On	Off	Off	Off	On	Off	On
1/4	1/4		1/4	Off	On	Off	On	Off	Off	Off	On
1/4	1/4	1/4		Off	On	Off	On	Off	On	Off	Off
1/4	1/4	1/4	1/4	Off	On	Off	On	Off	On	Off	On
		1/2		Off	Off	Off	Off	On	Off	On	Off
	1/2			Off	Off	On	Off	On	Off	Off	Off
1/2				On	Off	On	Off	Off	Off	Off	Off
1/2		1/2		On	Off	On	Off	On	Off	On	Off
	3/4			Off	Off	On	On	On	On	On	On
3/4				On	On	On	On	On	On	On	On
FULL				Not Applicable							
3/4			1/4	On	On	On	On	On	On	Off	On
1/4	3/4			Off	On	On	On	On	On	On	On
1/2		1/4		On	Off	On	Off	Off	On	Off	Off
1/2			1/4	On	Off	On	Off	Off	Off	Off	On
1/2		1/4	1/4	On	Off	On	Off	Off	On	Off	On
1/4	1/2			Off	On	On	Off	On	Off	Off	Off
	1/2		1/4	Off	Off	On	Off	On	Off	Off	On
1/4	1/2		1/4	Off	On	On	Off	On	Off	Off	On
1/4		1/2		Off	On	Off	Off	On	Off	On	Off

Quarter 4	Quarter 3	Quarter 2	Quarter 1								
	1/4	1/2		Off	Off	Off	On	On	Off	On	Off
1/4	1/4	1/2		Off	On	Off	On	On	Off	On	Off

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